Smithsonian

August 1989

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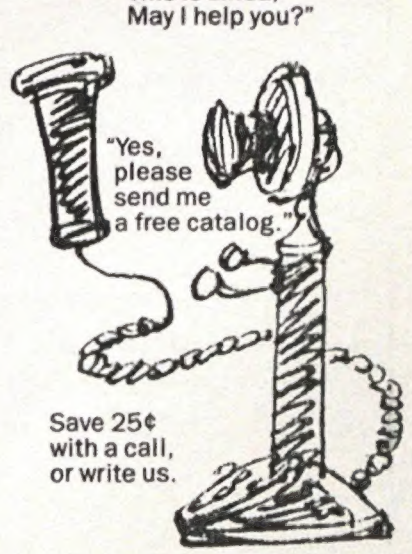

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August 1989

Smithsonian

Volume 20, Number 5

Table of Contents

Cover: Newly painted concrete silo on Kluenker farm dates to 1921; many in area were made with same mold (p. 30)
Photograph by Richard Hamilton Smith

10 *Smithsonian horizons* by Secretary Adams
14 *Letters to the Editor*
18 *Around the Mall and beyond* by Edwards Park
26 *Phenomena, comment and notes* by John P. Wiley jr.

30 **For born-again barns, new leases on old lives**
Down on the farm, from East to West, rescue efforts are afoot for these stately symbols of our rural past
By Jim Doherty
Photographs by Richard Hamilton Smith, Ping Amranand and Jose Azel

46 **From California, dinosaurs by design**
Extinction and technology come face-to-face in the robotized creatures of a company called Dinamation
By William H. Jordan jr., photographs by Peter Menzel

58 **Paul Stewart's romance with the West**
Long ago he saw a black cowboy—and the rest is history, displayed in his museum of black pioneers
By Evelyn C. White, color photographs by Barry Staver

72 **She's the maverick of the microcosmos**
Lynn Margulis' symbiotic theory revolutionized the way we see the cell; now she's eyeing the nervous system
By Jeanne McDermott, photographs by Richard Howard

82 **'It's like driving your car off a cliff'**
The thrills and chills that roller coaster fans seek in ever-wilder rides are fueling a coaster revival
By Richard Conniff, photographs by Chad Slattery

94 **Naked came the sea slug**
Forsaking its shell, the beautiful nudibranch relies on camouflage and chemical warfare to protect itself
Article and photographs by Fred Bavendam

102 **A family legacy grows in Baltimore**
Every city needs a William and Henry Walters, father and son, who created an exceptional art gallery
By Michael Kernan, photographs by Jack Kotz

114 **The officer who was no gentleman**
Though Alfred Dreyfus went to Devil's Island, it was corrupt Maj. Ferdinand Esterhazy who betrayed France
By Robert Wernick

130 *Book reviews*
134 *Picture credits*
135 *Additional reading*
136 *August events at the Smithsonian*
138 *Smithsonian tours, seminars and expeditions*

140 **When spelling—Pow!—wurdz can get you down**
By Joseph Kastner

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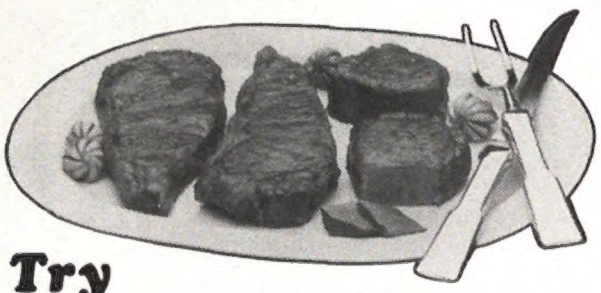

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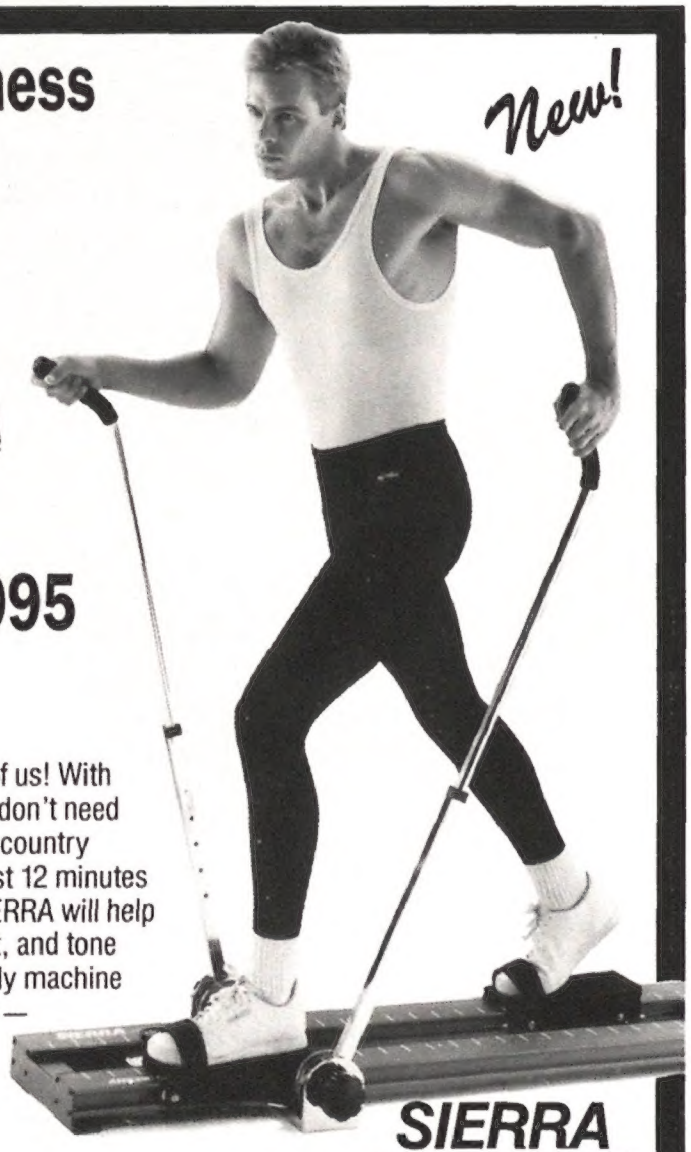

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Secretary Adams' comments

Smithsonian horizons

A new national museum may become a cultural rallying point for American Indians and their arts and traditions

Most readers of this column probably are aware of efforts that have continued fitfully over a period of several years to bring the Heye Foundation's splendid collection of American Indian art and culture from New York to Washington. Many individual contributions deserve to be recognized, principal among them Senator Daniel K. Inouye's single-minded and tireless but always diplomatic pursuit of this vision. As a result, enabling agreements have now been reached with trustees and officials in New York, and these are embodied in a new bill on which Congressional action is pending.

To cite the barest details of the bill, it authorizes construction not only of a new National Museum of the American Indian on the Mall but of a smaller exhibition facility at the Custom House in lower Manhattan, and a custodial and study center in nearby Maryland. Thus, while actual construction will likely have to await substantial progress in fundraising, this grand undertaking can reasonably be described as approaching the point of realization.

Further details, still awaiting clarification, are in some ways less significant than the character of the new museum as it has gradually taken shape in ongoing discussions with American Indian representatives. For while it will naturally hold to the professional and legal standards of any public museum, let there be no mistake: this museum will encourage the full participation of contemporary communities embodying the American Indian cultures it depicts. And to succeed in doing so, it seems absolutely clear that American Indian scholars and specialists must have a major role in the new museum's staff and leadership.

Other objectives are equally broad and ambitious. We expect the museum to deal not merely with the timeless past but, as a product of an unprecedented program of collaboration and outreach, with the new directions and challenges of Indian life and art today. Collaboration implies a relish for genuine dialogue, but also sensitivity. It should contribute to the empowerment of a growing and vibrant but still relatively victimized people, rather than to the further erosion of their control over their own lives. Exhibits are envisioned, therefore, that will not lead to a surrender of community standards of privacy, or the debasement through public display of what they regard as sacred.

The museum's most important concern will be to offer to a world public a full and variegated presentation of many voices—the generally familiar, well-published testimony of historians, ethnographers and archaeologists, to be sure; but even more urgently the less well known oral traditions of Indian elders, spiritual leaders, artists and ordinary people. As anthropologist Gerald Sider has observed, "Native peoples, evading or resisting domination, create their own structures of temporality. As time and meaning become intertwined in ancestry and kin-continuity, their own autonomous sense of history emerges. . . ."

The artistic quality of objects in the Heye Foundation collection is extraordinarily high, and the changing traditions of Indian art will obviously be a major focus of exhibitions and further collecting activity. This raises other questions, however, to which the answers are considerably less obvious—at least to me. Is the dominant quality of Indian art its "Indianness"? Even if this were true a few generations ago, what do we say as it continues to evolve in new directions? It may retain an "imagistic" concern with Indian themes, for example, but experiment increasingly with newer media, like jewelry, or with modern techniques, such as serigraphs, acrylics and the use of power tools. Or in some cases it may come to reflect only the shared experiences of individual Indian artists and the insidious pressures of non-Indian commercial interests. Some form of boundary is likely to remain (the critics, at least, will undoubtedly continue to search exhaustively for it). But the arbitrariness of choice as to what belongs in an Indian Museum and what in a national gallery is likely to become more and more evident.

Lloyd Kiva New, Cherokee artist and interim president of the new Institute of American Indian and Alaska Native Culture and Arts Development, was among those offering strong testimony before the Senate Select Committee on Indian Affairs when the Inouye bill was introduced last May. His was a quiet but resonant conclusion, that the museum itself would become a "symbolic giant accolade [and] . . . cultural rallying point," thus exercising a profound influence over Indian artistic expression to come. We'll do our very best to fulfill his dream.

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Letters to the Editor

Dust Bowl

Dear Sir: Your June article took me back to Sanford, Texas, in Dust Bowl days, when a black cloud of dust would arrive in our area along in the afternoon.

First time we saw it coming, a group of us were playing golf. We thought it was rain. By the time it got close enough for us to see the rolling dust, we were in its very middle and could see nothing—there was absolute blackness.

I still have a face mask that I wore every time I went out of the office. We changed the windshields in our cars every year because they became so sand-blasted we couldn't see through them.

I have never been sorry for having had the experience, but I sure as hell would not want to do it again.

Cliff Edwards
Bartlesville, Oklahoma

Dear Sir: As related in a publication for Associated Press retirees, the term "dust bowl" first appeared in a story edited by Ed Stanley, then A.P. bureau chief in Kansas City.

A.P. reporter Robert Geiger was covering areas being ravaged by blizzards of blowing dust. Stanley, editing Geiger's file for transmission to clients, needed an all-inclusive term to give readers in other parts of the country a concept of the situation and the territory involved. A fellow worker, asked for an idea, suggested "dish shaped."

Stanley considered "dust dish," "dust saucer," then came up with "dust bowl," which he put into the story—and the language.

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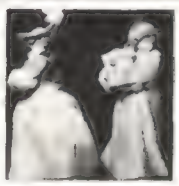

1. A. B. Schou: Wonderful shop in the heart of old Copenhagen offering significant savings on a breathtaking collection of the finest European gifts and collectibles. If it's made in Europe, ask the Schou family to find it for you. Color brochures. $3.

ITALY

2. Leather School: A monastery school offering exceptional values on fine Florentine leather goods, leather bags, luggage, desk sets, albums, wallets, etc. Color catalog $5 refundable.

Shop the World by Mail

3. Catalogs and Merchandise from around the world! A fabulous new 1989 collection of catalogs from 25 countries and a selection of wonderful merchandise from some of your favorite catalogers. Purchase china, crystal, clothing, handicrafts, jewelry, linens, perfumes, etc. at considerable savings direct from over 100 factories and retail shops in Canada, Europe, and the Orient. Color catalog. $4.

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THE NATIONAL TRUST

4. The National Trust: Entrusted with preserving and conserving the national heritage of England, our catalog reflects and epitomizes the estate collections in our care. Very special color catalog. $3.

SPAIN

5. Lasarte: Unquestionably, THE source in Spain for Lladro and Nao figurines as well as the famous porcelains of Algora, Buen Retiro and Capidomonte, the crystal of Lalique and the bronzes of Gallo. VERY reasonable Spanish prices. Color catalog. $4.

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6. Real Shetland Knitwear. Buy direct from the islands synonymous with quality, originality and sheer good looks in knitwear. Sweaters, cardigans, vests and cozy accessories available in a diversity of styles for every occasion. Color catalog. $3.

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7. The National Gallery: One of England's most popular museums since 1824. Color catalog offers a reasonably priced selection of gifts including cards, calendars, paperweights, desk accessories, games, prints, videos, etc. $3.

THAILAND

Elephant House

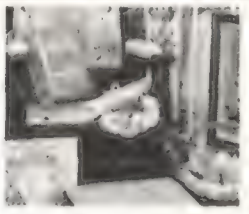
8. Elephant House: The finest indigenous Thai handicrafts gathered for the first time in one color catalog. Created by the Thai craftsmen as they have been for centuries. Gifts, furniture, lacquered boxes, Thai silks, wood carvings, etc. $3.

HONG KONG

A. ANDREWS & CO.

9. A. Andrews: The "Sears Roebuck of the Orient." 380 page catalog offering everything from Noritake china and cutlery to clothing, handicrafts, jewelry, electronic equipment and watches. $10 refundable.

ENGLAND



10. Glorafilia: England's foremost needlepoint collection. Stunning range of needlepoint and embroidery kits in mouthwatering colors to delight all lovers of this fine craft. Color catalog. $4.

THAILAND

Johnny's Gems

11. Johnny's Gems: Thailand is THE place to buy jewelry and embassy wives in Bangkok highly recommended this shop for unbeatable selection, great prices and incomparable service. Rings, bracelets and necklaces set with every imaginable kind of precious and semi-precious stone. Color catalog. $4.

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12. The Arctic Trading Co.: An exciting catalog from Canada's "last traditional trading post." Traditional and modern native arts and crafts, fur coats, tufting pictures and fantasies. Sound different? It is! You'll love it! Color catalog. $3.

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13. Historical Collections: Gift items from every period of English history. Celtic jewelry to Victorian toys—many are copies of museum pieces; all are authentic replicas. Reasonable prices. 48 page color catalog. $4.

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14. Venus Jewelry: Precious gems handcrafted into stunning rings by one of Bangkok's leading manufacturers/retailers. We have supplied U.S. military personnel for many years and guarantee that our prices are a fraction of the U.S. cost. Color catalog. $4.

HONG KONG

15. Wilco: A shopper's paradise of handmade items from Hong Kong and mainland China. Jewelry, cloisonne, table linens, and more—all at very affordable Hong Kong prices. Color catalog. $4.

ENGLAND

16. British Museum: Authentic museum replicas reproduced from some of our finest and most unusual treasures. Exquisite, unique, reasonably priced pieces include jewelry, sculptures, boxes, gifts, etc. Color catalog. $3.

HONG KONG

17. Prince Fashions: Fabulous prices on women's clothing, jewelry, watches and gift items from the largest mail order company in Hong Kong. This is the kind of source one thinks of when equating Hong Kong with wonderful bargains. Color catalog. $3.

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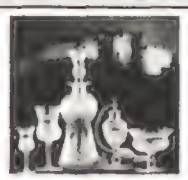

18. Stockwell: One of Scotland's leading shops, founded over sixty years ago and still family owned. Belleek, Edinburgh, Stuart, Waterford, Wedgwood, Lladro, Border Fine Arts and more. Outstanding selection; unbelievably low Scottish prices. Color catalog. $4.

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19. Naturally British: No visit to Covent Garden would be complete without a stop at this marvelous shop specializing in original items handmade by skilled British craftspeople. Collection includes furniture, toys, keepsakes, clothing, jewelry, pottery, etc. Color brochures. $3.

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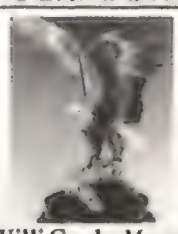

20. Willi Geck: Magnificent 112 page color catalog offers all the best in tableware, collectibles and giftware from Europe's most famous manufacturers. Seventeen shops offer outstanding savings and unrivalled selection. $5 refundable.

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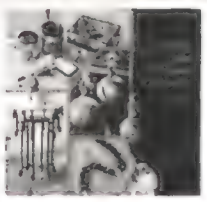

21. Amazing Grace Elephant Company: Wonderfully different gift catalog offering Asian handicrafts, antiques, jewelry and clothing—an extravaganza of unique gifts at non-extravagant prices. Delightful color catalog. $4.

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22. Royal Academy of Arts: The only catalog of its kind in the world! Most of the unique gifts have been designed by Members of the Royal Academy or inspired by works in the Academy's fabulous collection. Something for everyone at almost unbelievably sensible prices. Color catalog. $3.

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Dear Sir: Late one Sunday afternoon in 1935, I noticed a solid black bank traveling toward me, gradually getting higher and higher, closer and closer. Not knowing what it could be, I headed for the storm cellar. It was like nothing I had ever seen. There appeared to be red streaks mixed in with the black, which resembled smoke and rolled over and over, deathly silent, but moving steadily.

At nearby Ralls High School you could barely make out a figure at the opposite end of the hall, 120 feet away, because of the dust in the air. With fewer than 1,000 people in Ralls, there was at least a funeral a day, of those who had contracted pneumonia from the dust.
J. Perry Hendrix
Oroville, California

Dear Sir: Most Americans have "learned" that Oklahoma blew away in the dust storms of the 1930s. Western Oklahoma has long since recovered from poor farming practices, and I, here in tree-covered, hilly, central Oklahoma, am enduring our 14th day of rain out of 16.
Stephen S. Hull jr.
Edmond

River otters

Dear Sir: I am fortunate in that I can see river otters at our Arizona-Sonora Desert Museum, and the Asian small-clawed otters at Tucson's Reid Park Zoo. Last fall I had the pleasure of watching the Reid Park pair and their six young (the product of two litters) enjoying themselves in their pool.

There is another member of the *Mustelidae* that shares the otter's joy of life and sense of humor: the domestic European ferret. Its happy outlook on life and playfulness is one reason it makes such a delightful pet.
Virginia H. Childs
Tucson
Though delightful, pet ferrets are of concern to physicians because of their tendency to bite. Ed.

John H. Patterson

Dear Sir: His heroic work in the Dayton, Ohio, flood of 1913 was not the first time John Patterson had responded to such a disaster. In 1862 Dayton had suffered another serious flood. All efforts to rescue the Dickensheet family, stranded in their submerging house with the water still rising, had failed. John, then 18, and a friend commandeered a rowboat and, ignoring entreaties that they faced failure if not certain death, rowed off and rescued the family.
J. C. Aiello
Dayton

Dear Sir: I've been researching John H. Patterson's horticultural activities since finding a collection of NCR glass lantern slides in the attic of the University of Maryland's horticulture building. They depict winners of home landscaping contests Patterson sponsored in neighborhoods around his factory at the turn of the century. The September 1, 1898, NCR magazine called the $200 in prizes "an inducement to encourage ambitious rivalry among residents."

Patterson also sponsored boys' gardens for those who might otherwise cause trouble, such as breaking windows in his factory. The boys were given seed, tools, instruction, and use of factory land to grow vegetables for family use or for sale. First prize for the

best garden in 1901 was $5 and a medal.

One cannot help but wonder if similar programs today might not be successful in inner-city neighborhoods.
David R. Hershey
University of Maryland
College Park

Dear Sir: I lived in Dayton until I married, and swimming at Old River in the NCR park was a big event for our neighborhood gang. Feeding popcorn to fish in the boating stream was fun, too.
Bonnie Schmidt
Delhi, Louisiana

Surfing

Dear Sir: I grew up on the East Coast and didn't lay hands on a surfboard until I was stationed in Hawaii in 1966, but I married a lady who was a product of Orange County's beaches from 1944 to 1961. She tells me that up to that time the only musician who ever captured the rippling thunder of the waves was a surfer named Dick Dale.

For me, real surf music is the sound of Dick Dale and the Del-Tones or the Hustlers, the Marketts, the Rumblers or any pre-'61 precorporate stuff.
Tom Opilla
Laurel, Maryland

Dear Sir: Jon Krakauer quoted Mark Twain correctly, but *Roughing It* was published in 1872, not 1866.
Robert Jerome
Elmira, New York

TV news

Dear Sir: Your reference on page 80 to "Senator Adlai Stevenson" confuses me. I lived in Illinois when Adlai Stevenson was governor, but I was unaware that he was also a U.S. Senator.
Herbert L. Wiltsee
Atlanta
The reference should have been to "Governor Adlai Stevenson." It was his son, Adlai Stevenson III, who served in the U.S. Senate (1971-80). Ed.

Around the Mall

Dear Sir: My husband's dear grandmother, who died at the age of 97, often told us about the wonderful linden tree in her homeland, Germany. She loved its huge spreading branches and cherished memories of tea parties held under them. When we discovered the Smithsonian linden several years ago, we knew it was just like "Grandma's tree." We visited it every year, until last March, when we were so disappointed to find it gone.

We shall really miss it, but look forward to watching the new ones grow.
Gina Bauman
Tecumseh, Michigan

Dear Sir: When our game of mumbly-peg (as we called it) was over, the loser had to pick up a matchstick with his teeth after each of the other participants had driven it into the ground with the handle of his knife. Many times I dug out the dirt around the matchstick with my teeth in order to "mumble" the peg.

In one hazardous maneuver, a player dropped the knife, point first, through a circle formed by thumb and forefinger. I still bear scars from that one.
James F. Keefe
Jefferson City, Missouri

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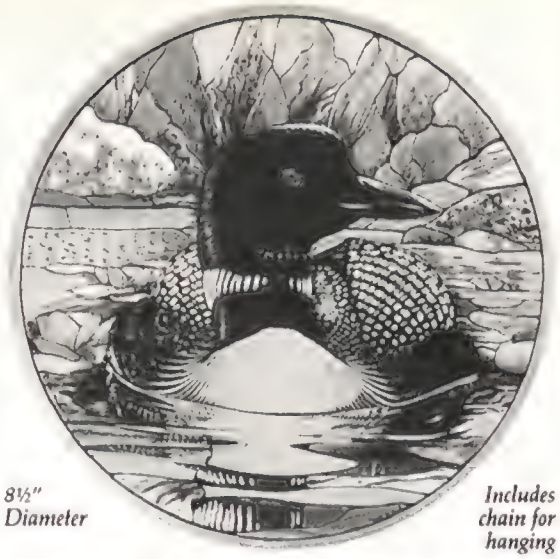

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Around the Mall and beyond

Having been born and raised in a cold climate, am I overly impressed by life in the warmth? Could be. All I know is that "Caribbean Festival Arts," the show at the S. Dillon Ripley Center on the Mall, knocks me out. In all these years at this strange and fascinating old Smithsonian, I've never seen such an explosion of color, sound and fantasy.

I attended the opening on a warm, humid morning in early June, a week or so before the great storm that flattened a corner of Washington. You get into the Ripley Center by going down from the Kiosk, and as I descended I was glad—though I like the warmth—to be out of that day's oppressiveness. And then, at the bottom of the long escalator, I was unquestionably in the tropics. Music echoed everywhere with those strangely addictive rhythms that send sedate stockbrokers squirming under lowered limbo poles on their West Indian vacations. Smells washed through the air: flowers, fruits, the island cooking that renders fashionable New York diets a matter for laughter.

I was in a street. It was, of course, the Concourse of the Ripley Center, lined by offices and meeting rooms, but the name had been changed to King Street and the office facades were covered by simple island housefronts in bright colors, with windows lurking behind louvered blinds. The buildings, a placard told me, are a composite of European styles, coming together to form the Caribbean's own architecture. Enclosed courtyards and tile roofs come from Spain; dormer windows and architectural symmetry are French; verandas, latticework and Victorian gingerbread speak in English; cheerful colors and ornaments hail from Africa.

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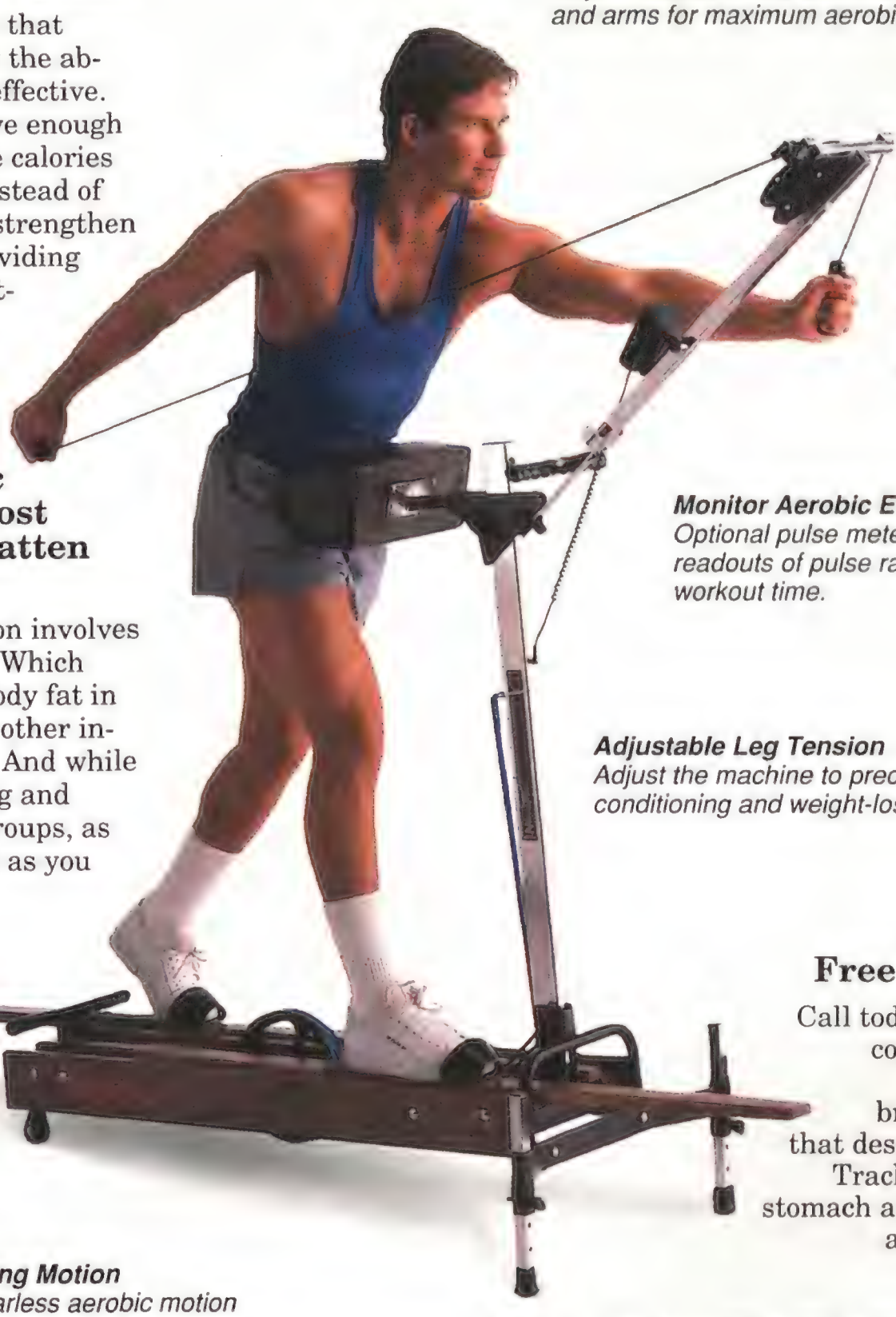

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The food smells soon lured me to a table where I drew a cup of coffee, sweetened it with brown sugar, stirred it with a stick of cinnamon and dunked in a piece of banana bread. A bowl of tropical fruits tempted me, but not as much as the nearby doorways that led into the innards of the exhibit. I passed along another street, more detailed and absorbing than the Concourse. The false front of a restaurant with louvered door displayed a blackboard outside: "goat, pumpkin and bodi," it said. Today's special, it noted, was hot roti for $2. You could buy Carib beer there at one time, but not today.

I passed more houses, some with stucco walls, some corrugated iron. Brown's Grocery, stucco with a corrugated roof, sold, said a sign, bulk syrup. Opposite stood a house painted orange, yellow and white, with bright-green shutters. A post office—the sign above it read "Kingston"—was a combination of strawberry-red and blue trim. The blue paint beside the front door showed the scratches left by someone who had rubbed a coin against it while waiting to buy a stamp.

Then I came to a street crossing—but the side street was really a giant photograph, a mural that filled a gap in the row of housefronts. The camera had aimed right down a little lane where children played and rainwater gleamed in puddles. I could swear I had driven along there once, long ago.

Music grew louder as I neared the end of this street. And I passed through a doorway into the heart of what this exhibit is all about: the festivals of the Caribbean and the arts they inspire. Here were startlingly lifelike mannequins wearing costumes, masks, giant headdresses, all in blazing colors. The figures were posed as though dancing in their native streets, and their own particular music thumped and lilted around them. Many of their faces, incidentally, were made from life masks, and some of the original, living faces showed up at the opening.

In one room I seemed to step ashore in Jamaica for its Christmas street festival, Jonkonnu. The British used to spell it "John Canoe," because that's how it sounds. The dancers, all men, go through paces that were established early in the 18th century. Years ago, on a job in Jamaica, I stumbled upon a Jonkonnu rehearsal deep in the countryside. It was made clear to me, po-

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litely, that this was a private happening, and I apologized and drove away. Here was a chance to see what I had missed: mime dancing, costumes that imitate animal shapes, masquerade characters or the finery of the old British colonial planters.

Then I leapt geographically to Bermuda where a Gombey band beat out its compulsive rhythm. Some figures here wear costumes depicting American Indians. I was informed that the notion of including them came from migrant workers from St. Kitts and Nevis, some 80 years ago, and that Gombey, the Bermudian version of Jonkonnu, is traditionally performed on Boxing Day, the first weekday after Christmas.

Then down to Trinidad and Tobago, where Carnival originated as a pre-Lenten festival of several days, starting off with Jouvay. That's a corruption, I learned, of the French "*jour ouvert*"—"opening the day." Freed slaves and indentured plantation workers dominated Carnival in the 1840s, and through it made important political statements, a tradition carried on today. Some 60,000 people took part last year, and their costumes reflect their present lives as well as their traditions: the "Midnight Robber," for example, dressed in purple and gold and carrying a dagger, wears dark glasses—obviously a symbol of evil!

"Diana, Goddess of the Hunt," was created by Wayne Berkeley in 1988.

The mannequins of a "Mas" (masquerade) band, glittering with gold and shiny buttons, wore broadly flaring pants. Tobago and Trinidad, we are reminded, were overrun by British tars when the old sailing fleets dropped anchor there.

Members of each Mas band dress in costumes of a theme chosen by the band; all are bright—reds, oranges, golds—to keep pace with the dazzle of festival dancers. Great thought and labor go into the costumes that performers wear, because a formal, two-week competition is held in Trinidad. So notable artists are involved in the designs, and many of the best ones are represented here at the Ripley Center.

One costume—almost a walking float—stopped me in my tracks. "The Warrior and the Battlefly" is a vastly imaginative depiction of a man riding on the back of a giant fly, as though it were a horse. This huge contraption has a purplish-blue body, six hairy legs, a pair of long, gold antennas and four wings, nearly transparent, shimmering with reflected light. Round, clear-plastic eyes stare balefully from its great head, and vicious-looking teeth gleam in its mouth. Of course the "warrior" doesn't

Nantucket, Massachusetts

really ride it, but walks along inside it. Fake human legs clutch the fly's flanks as though the man were astride the insect. He carries a sword and a shield, and his helmet is adorned by his own set of antennas.

Noel Audain designed this wonderful creature and wore it in the Caribana Parade in Toronto, where he now lives. He's just one of many Caribbean artists who live abroad, as so many of their countrymen also do. Toronto is a big West Indian center—perhaps further proof of my theory that interest in the area blooms in cold climates. The Caribana Festival will fill the city's University Avenue this month, and a Caribbean Carnival will also whirl about Notting Hill Gate in dear old, chilly London. Later, on Labor Day, costumed West Indians in force will parade along Brooklyn's Eastern Parkway. Caribbean immigrants enliven many other cities, warm or cool. Montreal has many; so does Los Angeles. New Orleans picked up a generous number of French-speaking Haitians during some intense turbulence on that island during the 19th century.

African heritage inspired "Me Myself I Warrior" by Arthur Peters, London.

And now Washington has a chance to see the arts of these festivals. The Ripley Center exhibition came to us from St. Louis, and in 1990 moves on to the Brooklyn Museum before traveling to Seattle and Toronto. The genius of its co-curators, John W. Nunley of the Saint Louis Art Museum and Judith Bettelheim of San Francisco State University, and of project director Vera Hyatt has inspired the Smithsonian to hold other Caribbean programs on the Mall.

The Caribbean was a major theme of the Folklife Festival this summer. In the Ripley Center, "Family Days," on the first Saturdays of the summer months, have brought calypso, steel bands and reggae along with costume designers and craftsmen to show off their skills. The next such day, scheduled for August 5, will feature the East Indians, who form a notable group in the West Indies. Currently dominating the end of the Concourse is a glittering *tadjah*, a symbol of the Hosay Festival celebrated by the East Indians of Trinidad and Tobago. The Family Day on September 2 will be all about Jamaica.

And the Resident Associates are serving up West Indian music and poetry along with regional food, in a course called "Summer Nights in the Caribbean."

If you don't get a taste of all this, you'll be sorry when snow flies.

Edwards Park

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Phenomena, comment and notes

A sudden death, and suddenly it's 1940 again and a child is being shown all that there is to see on an empty beach

Back when I was little, it was dangerous to complain that there was nothing to do. Often as not, my mother would announce an expedition that sounded boring, dumb, dirty, wet and cold. At home in New Jersey it might be a walk upstream along the creek that flowed by our house, into the vines and briars and hornets' nests. If we were in a tiny cottage in Massachusetts, it would be a rainy-day walk along the beach and across the rocks that lined the shore. We would fuss and pout, but we always went. Hours later she would announce it was time to go back and we would protest even more vociferously: we had become so caught up in the world she was showing us that we did not want to leave. Down deep, I never have.

These were not so much goal-oriented trips as they were immersions. In the woods we children would look around for deer, but she would quietly point out the caterpillars and praying mantises, horned beetles and dragonflies. We learned to admire rather than fear snakes, to have a beginning appreciation of what today would be called ecology. At home we read Thornton Burgess on life at the Smiling Pool, but we also read a marvelous, now-defunct magazine called *Nature* (which had no connection with the British scientific journal), a guide to seeing the natural world, and we knew there was nothing "wrong" with predators killing to live.

Along what looked like empty beaches, we learned to pull apart mats of seaweed left by the tide to find invertebrates still very much alive. We played

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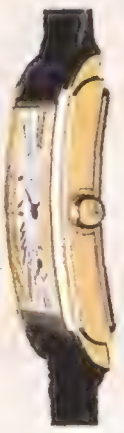

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A rocky shore near Gloucester, Massachusetts, once served as an impromptu classroom for a woman who was a born naturalist.

with kelp fronds, popped the bubbles on rockweed, chased ghost crabs, threw jellyfish at each other. We watched terns diving, sanderlings probing, gulls scavenging. Where rocks lined the shore we became hypnotized by tide pools and the sea stars and crabs and sea anemones for whom this was the entire universe. In protected bays we peered from rocks and rowboats into shallow water to see horseshoe crabs lumbering, sculpins lurking, tinker mackerel flashing. She had a Rachel Carson ability to make the sea come alive without ever strapping on air tanks and plunging in.

For her, nature was not something to be admired from a polite distance; we were not to be museum visitors on our best behavior. She was constantly touching, smelling, holding, picking up. We always came back loaded with flowers and seedpods, shells and driftwood, interesting rocks. Wherever we lived the windowsills were lined with quiet treasures; spectacular finds came to rest in glass cases.

What I remember best about those walks is not so much the learning as the feeling of being fully alive. In my memories the light is very intense, as it is when one's senses are heightened. Sometimes it is the summer sun on the foliage along that ditch in New Jersey; more often it is gray, rainy days along the beach when a spot of color on a shell or a splash of red seaweed appear preternaturally bright. I enjoy a sunny, "perfect" day as much as the next person, but there is still something sensuous and exciting about days when the clouds are low and dark, the wind an insistent presence, the occasional rain coming sideways. And there is still something incomparable about coming back in, laying out wet treasures and stripping off wet clothes, diving into a hot shower and then a bowl of hot soup, and sinking into warmth and sleepiness.

My mother interacted with nature in more direct ways. Early on we learned to use clam rakes to collect a bucket of steamers for supper. Fishing was a natural extension, not as a fancy hobby but in a food-on-the-table kind of way. She taught us to fish with hand lines wound on wooden frames, smashing clams on the gunwale for bait. When we had no clams, we used periwinkles, the little round snails that were everywhere on the rocks. It was only last year that I learned from the *New York Times* that periwinkles are not native, that they had first arrived from Europe 150 years ago, and that they may be one reason the New England coast remains rocky: the periwinkles eat the algae that might otherwise trap sediments and begin the building of marshes. I had always meant to send her a photocopy.

My mother walked beaches all her years, wherever life took her. She collected sea fans in Aruba and the bleached skulls and bills of pelicans in Baja California. She picked up rocks in Ushuaia in southernmost Argentina and in Portree on the Isle of Skye in Scotland's Inner Hebrides. She watched birds all her life, but never understood the competitiveness of birders. She had no objections to pretty birds, and put out food for the pheasants that came into her yard. But it was for the crows she saved the special scraps. She admired the boisterous mob of gulls at the dump. She was always happy when the summer people left and the paved roads could be reclaimed for their natural purpose: the smashing of clams dropped by more resourceful birds.

Her last two notes to me were about birds. One was about the Royal Society for the Preservation of Birds buying a 12-acre island in Scotland's Firth of Forth. The island may have been the inspiration for Robert Louis Stevenson's *Treasure Island.* More to the point, apparently, is that the 12-acre island is a major nesting site for puffins, kittiwakes, razorbills, guillemots, fulmars and shags. The other concerned screech owls in Texas that carry wormlike, blind snakes to their nests, where the snakes eat the maggots and other insect larvae that live in the chicks' droppings. Owlets in nests with captive snakes grew faster and were more likely to survive, the researcher found. "Do you believe this?" she demanded. I don't know, but I learned too much those many years ago to dismiss it out of hand.

My mother died unexpectedly last May, in her sleep, on a cross-country trip to graduations of grandchildren. There followed endless hours on the telephone; endless meetings with funeral directors, cemetery directors and clergymen; endless trips to airports. No time to think, no time to mourn. But once, waiting for a red light in the hot sun, I watched a rogue strut on a patch of raw dirt by the side of the road: a starling glistening black, flecked with gold, flaunting some treasure caught tightly in his bill. Birders hate starlings as overaggressive interlopers. But my mother would have winked at him. For a moment, a bird swaggering in that intense light became the Universe; the world stopped while I saluted him.

Later, two of my children and I went up to Massachusetts to make still more arrangements. We worked hard. And then we went to the beach, to recapture a little of our respective childhoods. We walked down the inside of a barrier island, watching horseshoe crabs mating and inept gulls dropping clams on the sand. Then we came back the ocean side, stopping to pick through storm wrack and watch the terns diving just beyond the surf; we danced in and out of the wash like oversize sanderlings. The sun was setting; the wind was blowing hard off the water. It was the right place to be.

John P. Wiley jr.

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Angus cow ambles toward a spruced-up 1930s barn poised atop a hill in eastern Virginia like a ship at sea.

By Jim Doherty

A barn is more than a building, it is a shrine to our agrarian past

With gleaming metal roof and fresh coat of paint, building evokes memories of simpler times for farmers.

America's familiar old barns have been going to seed for years, but now their admirers are cultivating a lofty new goal: preservation

OK, so we've been on this country kick for years now, right? We wear country clothes, buy country crafts and collect expensive country "antiques" our rural grandmothers would have pitched onto the junk pile. We read country magazines and dream about living in a big farmhouse under a nice shade tree. We've boosted country music, pickup trucks and good old boys to the status of pop icons. All of which is fine and dandy, but I've got a question for you.

What have we done for barns lately?

Basically what we've done is this: we've knocked the living daylights out of them and used the boards to panel our rec rooms. The familiar old American barn, in case you've been too busy celebrating country chic to notice, is becoming an endangered species.

I know what you're thinking. "Oh, no. Not another one of those 'goodbye to the whatchamacallit' stories that make me want to lie down in front of a bus." Trust me. It's not one of those. It's a happy story about what's being done to save barns. You'll meet some swell people. But before we get to them we have to take a minute to consider what's at stake here.

Besides, it's probably been so long since you last set foot in a barn you can't even remember what it's like. In which case, please allow me, as one who has owned several of these buildings and poked around in perhaps a half a hundred others during the past few months, to refresh your memory.

How a barn works its spell

The first thing you notice is the tremendous amount of space. A barn feels a lot like a church inside. Even a small one seems big because when you stand between the haylofts and look up, your view of the roof is unobstructed, save for the massive timbers that support it. The next thing you notice is the smell—hay and manure, for sure, and perhaps, depending on the time of year, a whiff of apples or freshly split cordwood. Something happens to the quality of light in a barn. Remember? It becomes softer, richer; it takes on the warmth of the beams. If there are horses or cattle in the building, you can hear them moving around and sense their alert presence. On a clear winter night, with moonlight flooding in through the open doors, you may also sense the presence of others who have been in the barn before you, the generations of families who worked in it and cherished it, the neighbors and craftsmen who helped raise it a century or more ago.

The point is, barns are special. They're not just buildings; they're part of the rural landscape. It's impossible to imagine the countryside without them. They're temples of abundance, dedicated, as the novelist and Ohio farmer Louis Bromfield put it some years ago, "to plenty and to the beauty of the earth."

Photographs by Richard Hamilton Smith, Ping Amranand and Jose Azel

Sash casts latticed shadow on sawdust-covered floor of magnificent barn (opposite) in hills of the Piedmont.

They're also shrines to a vanishing way of life. At a time when the family farm is passing from the scene, the barn remains a symbol of our traditional rural values—things like hard work, pride of place and self-sufficiency.

Most older barns were built using local materials and construction methods unique to their time and place. Southern tobacco barns, the connected farm buildings of New England, the cantilevered general-purpose barns of Appalachia and the prairie barns of the West—they're all time capsules of farming in bygone eras. As such, they can help historians, architects and folk scholars learn how our agrarian ancestors worked and lived.

That's something we ought to know. For much the better part of our history, this has been a nation of farms and farmers. Two centuries ago, nearly everyone either lived on a farm or farmed the land he lived on. George Washington was a farmer. Thomas Jefferson was a farmer. Farmers transformed the American wilderness into the breadbasket of the world, and in small rural towns and backwater villages the seeds of a quintessentially American culture took root and grew.

As recently as the late 19th century, most folks still lived in the country, but by then a momentous shift from agriculture to industry was well under way. During the past 50 years, the number of farms in the United States has plummeted from well over six million to little more than a third of that. Today most of us live in cities and suburbs. Millions of people only a generation or two removed from the farm have no sense whatsoever of any connection with the land. Barns remind us where we came from and help us understand who we are.

The center of the farmer's universe

But let's not get carried too far afield. The barn is, first and foremost, an eminently practical facility. It's the working center of the farmer's universe, the place where many of the life-and-death things that happen on a farm come together. It's good for things besides farming, too. It's a great place for children to play. You can move a family reunion into a barn if it starts to rain. Once I even had an office in a barn; woodchucks and swallows used to keep me company out there.

Appealing though barns may be in many ways, most of us take them for granted, which is to say, we ignore them. We make a big deal about saving lighthouses, covered bridges and other folksy landmarks, but we have yet to confer that kind of status on farm buildings. As comedian Rodney Dangerfield might put it, they get no respect. Instead of praising them, we've been razing them.

There's no telling how many barns we've demol-

Built c. 1936, the newly refurbished horse barn at Meadowfarm in Orange, Virginia, originally housed brood mares. Now used as a riding stable, cavernous 210-foot-long structure features 2,273 panes of glass.

ished to make way for houses, highways and shopping centers, but development isn't the only threat. An even bigger problem is dereliction. Overextended, short of cash, battered by uncertain prices and recurring drought, many farmers are letting their older buildings go to seed. Some have written them off as obsolete and acquired new metal structures that are supposed to be better suited to big equipment and modern systems. As others sell out or undergo foreclosure, the consolidation of their holdings into larger operations results in the abandonment of buildings that are no longer needed. This is why, when you go out for a ride in the country these days, you always seem to end up crossing vast stretches of farmland that look like junkyards for wrecked barns.

The good news is that help's on the way. I've been looking at barns and talking to farmers and other interested parties in the Midwest and New England, in the Chesapeake Bay area and on down through the Shenandoah valley and the Piedmont plateau. I've seen too many buildings falling apart, but I've also been pleasantly surprised to discover how much is being done to rescue others from a similar fate. A full-blown save-the-barn movement it's not, but something is definitely going on out there.

A member of the Board of Editors, Jim Doherty has written recently about beekeeping, canoeing in the boundary waters and model-train hobbyists.

Some farmers are fixing up their older buildings to play new agricultural roles. In areas where farming is finished, businessmen, architects and others are converting barns to nonagricultural uses—everything from beauty salons and hobby shops to restaurants and office buildings. Meanwhile, historians and preservationists are doing more than ever before to see that barns receive the recognition they deserve as cultural resources. "Renovations for economic reasons have been occurring on farms for a long time," says George Pratt, chairman of the department of agricultural engineering at North Dakota State University in Fargo. "But the interest in combining practical renovation techniques with historic preservation is new."

The National Trust for Historic Preservation has been in the forefront of rural conservation for more than a decade. Its regional office in Denver specializes in helping ranchers and farmers find practical ways to keep aging barns active. "If a barn is useful," says program associate Mary Humstone, "its owner will take care of it."

Humstone and her colleagues teamed up last year with the editors of *Successful Farming* magazine, published by the Meredith Corporation in Des Moines, Iowa, to sponsor a clever venture called "Barn Again!" The idea was to encourage barn rehabilitation by running a contest. More than 500 farmers in 34 states entered. "The majority of them had already gotten the message," says John Walter, the magazine's conserva-

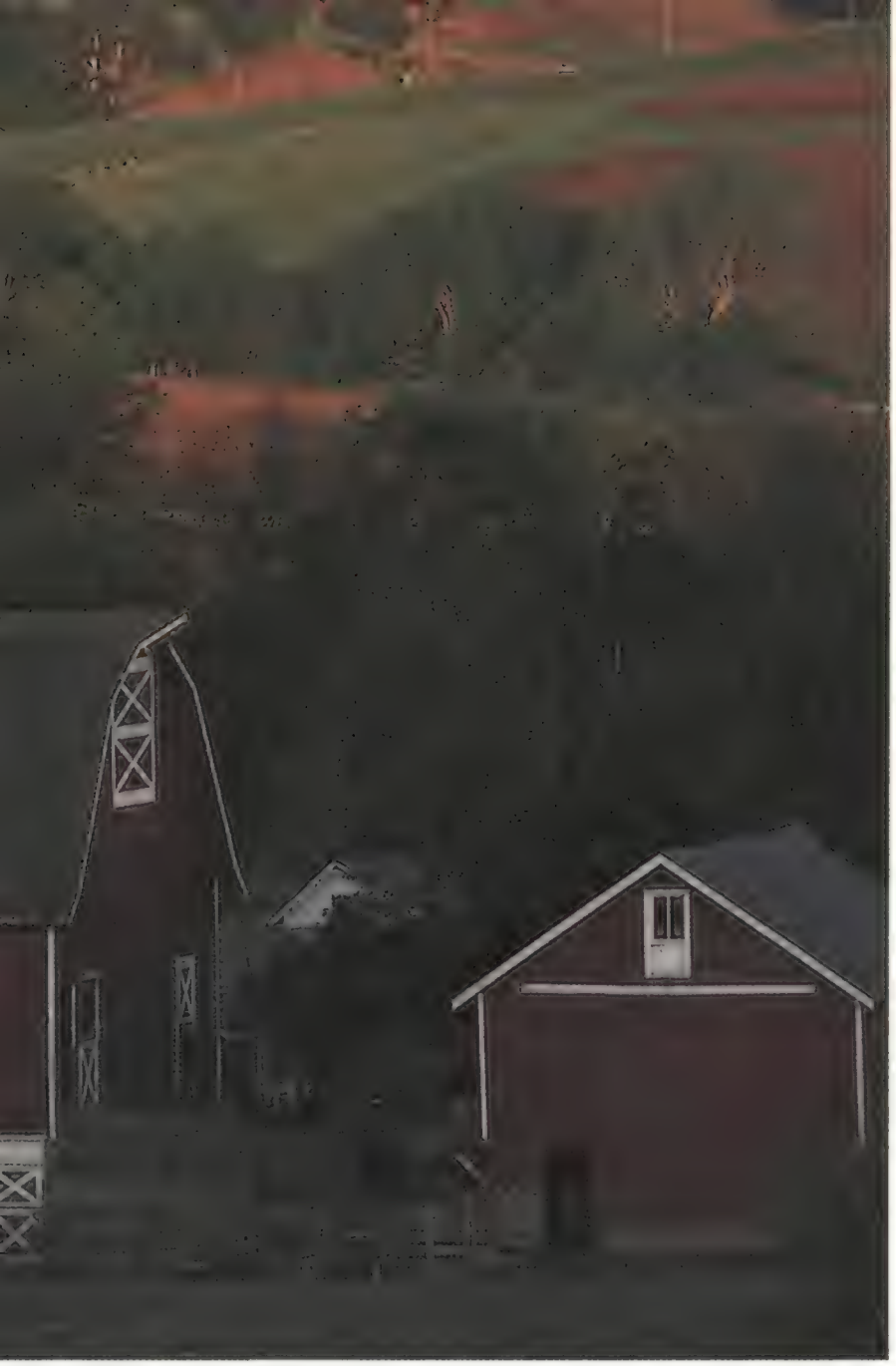
At the Langgaards' farm in Iowa, a puppy peers out symmetrical doors on south side of main barn (right).

tion editor. "They knew their old barns had the kind of flexibility and space that modernization requires, and they knew rehabbing would be cheaper than buying new metal buildings. The conventional wisdom in agriculture says bigger and newer is better but a lot of farmers just don't believe that anymore."

Most born-again barns are being updated to handle storage and other "mainstream" chores; some are being switched to unconventional uses. Linda McDiffett, for example, has transformed the 1918 horse barn on her ranch outside Alta Vista, Kansas, into a store that sells everything from locally produced popcorn, beef, pork and homemade pies to antique furniture and miscellaneous gifts. Kate Firestone, who runs the J. Carey Cellars in Solvang, California, makes wine in a 1920s dairy barn, basically unchanged except for removal of stalls. Ronald and Doris Rollefson, who live on a farm in northwestern Minnesota, recently converted their dairy barn into a mushroom-growing complex.

While some farmers seek out new things for their old barns to do, others strive just to maintain the status quo. Helen Marie Taylor traces the origin of Meadowfarm, her 10,500-acre estate outside historic Orange, Virginia, to a grant in 1722 from King George II to Col. James Taylor II of Caroline County. Having been in the thick of several battles to preserve Virginia landmarks, Taylor is no less determined to take care of her own. An icehouse has been restored to mint condition. A complex of dairy buildings erected in the 1930s is being used now for storage. But the most interesting structure on the farm, which produces beef, grains and timber, is an unusual 210-foot-long barn built around 1936 for brood mares and currently being leased out as a riding stable. Made of oak post-and-beam construction, it contains 20 stalls, a tack room, an office and a one-tenth-mile dirt track encircling the stalls. The stunning exterior is distinguished by four prominent cupolas, wainscot panels and a sash containing 2,273 panes of glass. Taylor recently had the elaborate building overhauled at considerable expense. When I asked her if it was worth it, she dismissed the question. "That barn is part of this area's *history*," she answered.

Meadowfarm is also home to four Sears, Roebuck barns, including the granary (pp. 30-31). From 1911 through the early 1930s, Sears ran a mail-order barn business as a complement to its better-known line of prefabricated houses (SMITHSONIAN, November 1985).



Neva Langgaard watches husband Erwen feed lamb in part of barn originally used for dairy cattle, horses.

Huge, hip-roofed structure, erected in 1923, has three stories—for hay (top), grain (middle) and livestock.

It's a long way from the hills of the Piedmont to the cornfields of Guthrie County, Iowa, where Erwen and Neva Langgaard raise livestock and grow grain and hay on a 237-acre farm near the South Raccoon River. Iowa has been hit hard by the so-called farm crisis, and it shows. Driving west and north from Des Moines on a brilliant summer afternoon, I passed one dilapidated barn after another. If the Hawkeye state's farm of the future consists, as apparently it does, of a house trailer, some metal sheds, a grain dryer and a satellite-dish TV antenna, then the Langgaards live on a farm of the past that appears shockingly well maintained—especially the barn. It's a big, gleaming, red-and-white job built in 1923, and when you come up the gravel road past the ruins of the schoolhouse where Neva taught 36 years ago, you can't miss it.

Neva took me through the building because Erwen was off running errands. First she showed me the lower level, which originally housed dairy cows but has been modified for hogs, goats and lambing-out sheep. Then we looked at the second level, the "drive-in" floor, where the grain bins and scales are. Finally we climbed a ladder to the stupendous loft, which is big enough to hold a year's supply of hay and straw. When we were done, Neva explained why she and Erwen have been so fussy about painting and otherwise maintaining the building: because they need it, because it's a local landmark and because they want it to look nice. "I still get a kick out of that barn every time I see it," she confessed with a grin.

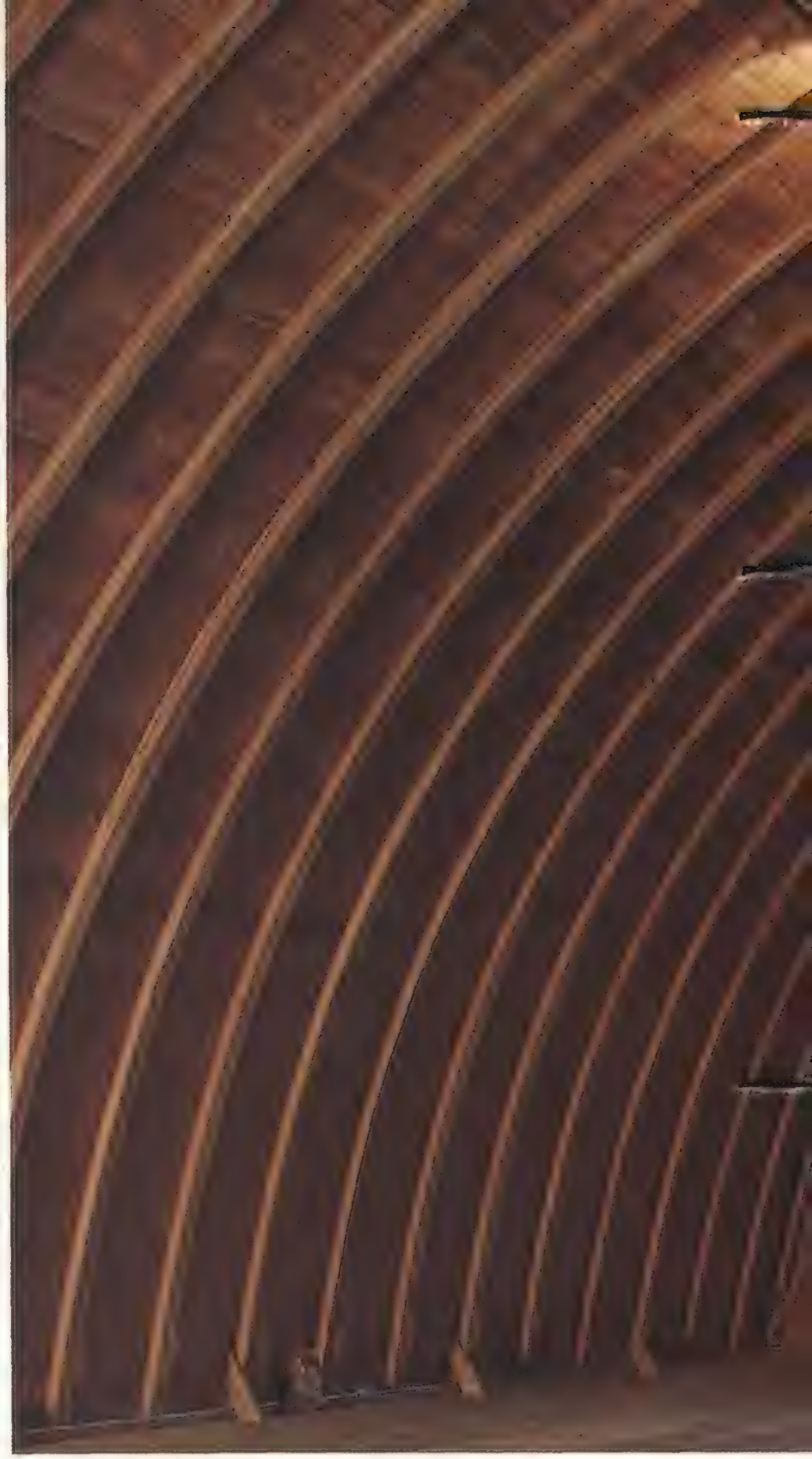
The settlers who put up America's first barns didn't even think about keeping hay in them. The buildings were used mainly for threshing and storing grain. At first, labor was done manually and meat was obtained by hunting, so shelter for fodder and work animals wasn't needed. Later on, as farms increased in size and complexity, more elaborate buildings were erected to accommodate oxen or horses and other livestock, as well as wheat, corn and hay.

It has been suggested that barns in this country developed in response to the particular needs of farmers, which is true, and that therefore the buildings were unique, which is not as true. Barns built here in the 17th, 18th and 19th centuries were adapted for the most part from European prototypes. The three-bay Yankee barn that became common throughout New England was known to have existed in Britain as early as the 16th century. The Dutch farmers who settled in New

Text continues on page 40

The soul of a barn is the sum of its parts

Mourning dove rests in rain gutter on reconditioned barn at the Kluenker farm, near Manitowoc, Wisconsin.



Curving rafters create a cathedral-like effect in restored Virginia barn previously used for mules.

Old hay wagon collects sunlight next to a brawny post in Richard Yerkes' dairy barn in upper Vermont.

Horseshoes ring a rafter in Kluenker shed; some were worn by horses that worked the farm many years ago.

Remnants of original blueprints for Langgaard barn adorn the grain-bin wall above coils of wire and hose.

One of the Langgaards' cats stands sentry at barn door. Good mousers are a fixture on any working farm.

At Meadowfarm stable, the hay is stacked on top of stalls located inside oval riding track. The tentlike roof is more than 200 feet long and requires elaborate framework of rafters, beams, posts, Y-shaped braces.

Corner joint in a Virginia tobacco barn is secured with wooden pegs pounded through auger-bored holes.

Bird rides point on fancy weather vane decorating cupola that provides ventilation for Langgaard barn.

Karl Kluenker's basketball "net" for grandchildren was made of washtub and elbow joint of a chimney flue.

A faded clockface on Yerkes horse barn has unintended irony: time's running out on the dilapidated building.

York State in the 17th and 18th centuries based their distinctive barns on those descended from the ancient farm buildings of Saxony and the Netherlands, with their characteristic end doors and yawning naves. In southeastern Pennsylvania, German immigrants (and later, others) patterned their so-called Dutch barns on Swiss buildings that featured a prominent forebay, or overhanging upper story.

Despite certain differences, many barns had at least a couple of things in common. Often they were built against the slope of a hill or an embankment (hence the term "bank" barn). This provided some protection from the weather; it also gave wagons easy access to the upper level while enabling livestock to amble in and out of the "basement" stable. Another thing many barns had in common was the way they were built: on a stone foundation, with heavy timber framing, vertical board siding and a gable, gambrel or hip roof. Most people assume that silos have always been in the picture, but they didn't make an appearance until well into the 19th century, about the same time circular barns and red paint (concocted from a mixture of skim milk, lime, iron oxide and linseed oil) appeared.

The most remarkable thing about an old barn is its framing. Usually the thick timbers needed for the skeleton of a building were felled in the process of clearing the land. Sometimes they were laboriously squared off with a broadax; other times the bark was left on and rough hewing was done only as necessary for fit. Units of the frame, called bents, were prefabricated on the ground, then raised and held in position with long pikes, ropes and pulleys until they could be joined. All of the members were snugly connected with mortises and tenons, and secured not with nails or other hardware but with wooden pins driven through holes bored using an auger.

The barn as a guide to the past

It's the rugged majesty of these brawny configurations that gives a barn its overwhelming physical presence. The framing also contains valuable historical clues. "Once a barn is gone, you'll never be able to understand its past," says Edward Chappell, an architectural historian at Colonial Williamsburg and a prime mover behind a group in the Chesapeake Bay area called the Friends of Friendless Farm Buildings. "You want to know how it was used and changed over the years—how it started out as a tobacco barn, was converted to a stable at one point, sat abandoned for half a century or so, then was made into something else. But you have to be able to study the *building* to learn such things. When you're dealing with vernacular architecture, you seldom have blueprints and written records to consult."

Architect Jay White inspects original beam under roof of Round Barn in Waitsfield, Vermont (opposite).

Workmen put on new cedar shakes. Built in 1910, local landmark is being renovated from top to bottom.

If scholarship and sentiment are powerful forces for barn preservation, so, especially in a state like Vermont, is tourism. Since World War II, the Green Mountain state has experienced a decline in farming and a boom in its tourist industry. The worry is that the problems of one may affect the quality of the other. Its charming rural landscape, after all, is what attracts many visitors to Vermont in the first place. That being the case, Vermonters have concluded, it makes sense to keep the farm buildings that have contributed so much to the state's character, even if it means using them for other purposes.

Take the Round Barn Homestead on Grand Isle in Lake Champlain. It was built for dairying by E. J. Parker in the early 1900s and converted into a 16-unit apartment complex for senior citizens some 70 years later by Frank Guillot, a Burlington architect. Or, take the Common Man restaurant in the Sugarbush ski area. When restaurateur Michael Ware and a partner bought it in 1967, it was in a classic New England bank barn. In February 1987, it burned down. Ware, something of a connoisseur of Vermont barns—who, as it happens, was born in an English town called Barns—found a replacement, an 1850s "queen post" type, in nearby Moretown. He dismantled it, moved it to Sugarbush and put it up on the old footings, where the restaurant is back in business today.

Down in the Mad River Valley, the Simko family is doing its part for rural preservation. After retiring from their florist business in New Jersey a few years ago, Jack and Doreen bought the old Joslyn farm in Waitsfield, on the East Warren Road—85 acres of meadows, ponds and woods; a huge house dating back to the early 1800s; and an imposing round barn built in 1910. The Simkos and their daughter Annemarie spent 18 months converting the house into an inn; then they turned their attention to the barn.

Actually a 12-sided building, or dodecagon, it was shored up on 5,000 pieces of cribbing the morning I saw it, so a construction crew could get underneath to pour a concrete foundation. One side had gotten out of plumb by about half an inch and contractor Arnold Graton was telling the workers what to do. I went up onto the second level with Annemarie and Jay White, a tall, mustached architect with the Burley Partnership. Some of the floorboards felt spongy underfoot, there were holes in the roof and you could see where water was damaging the beams. "In a few more years, it might have been too late to save it," White said.

The Simkos intend to use the building in a variety of ways: as showroom and work space for local artists and craftsmen; as a regional performing arts center; and as a recreational facility for guests at the inn. "We're adapting our uses to the building, not the other way around," Annemarie told me. "That's the only way to do this kind of restoration work."

White and his firm have been involved recently in an even more spectacular project just across the border in New London, New Hampshire, where they converted two pre-Civil War dairy barns into a library for Colby-Sawyer College. It's quite a place. After entering through the restored silo, you find yourself in an airy, multilayered shed full of high-tech hardware, books, offices, carrels and comfortable furniture. A hayfork hangs from the ceiling; a large pulley dangles over the card catalog. When you sit in one of the shadowy "reading lofts" on the uppermost level, the feeling of barnness is complete. You're surrounded by farming artifacts, original beams, plates, rafters, barn boards. "The students have a warm, rustic reference center and the townsfolk have part of their heritage," says H. Nicholas Muller, who was president of the college when the project began and now heads the Wisconsin State Historical Society in Madison. "The familiar silhouettes of the barns and the silo are still there for everyone to see."

Although the good people of New London may be delighted, such is not always the case when barns are threatened with change, as Richard Yerkes knows only too well. His predicament illustrates how complicated and downright contentious barn preservation can get. Twenty years ago, Yerkes, then a home builder in the Philadelphia area, bought a 365-acre farm outside the village of East Burke in northeastern Vermont. It was built in the early 1900s by a New York City hotelier named Darling, who used it to provide fresh dairy products for his hotel restaurant. It consists of a rambling Victorian farmhouse and an entire community of fabulous farm buildings. Some of them—a fancy brick creamery with an elegant clock tower, a sensational main barn, a superb carriage house—are of unquestionable historic value.

Acres of roof to worry about

Darling could well afford to keep the place up; Yerkes can't. He's 72 and his wife, Marion, is ailing. He pays $12,000 annually in property taxes but no longer operates the farm as a revenue-producing inn and ski hostel. He has 2½ acres of roof to maintain and some of it is beginning to leak badly.

Yerkes wants to sell the farm to out-of-state developers, who intend to convert some of the buildings into condominiums, a restaurant and a ski center, but the project has been bottled up in an environmental-review process for months. The state historic-preservation people objected because the original plan would have "compromised" the design of the main barn (p. 42). A number of Yerkes' neighbors are upset, too. They worry

The ramp area of historic dairy barn in East Burke, Vermont, exhibits unmistakable signs of deterioration.

about everything from increased traffic and the development's impact on local wells to changes in the appearance of Yerkes' buildings and the area's bucolic character. "These people have sawdust for brains," Yerkes fumed when I stopped by to see his place. "The developers have come up with a thoughtful, sensitive way to take structures that aren't being used, and are in a state of disrepair, and make them *useful.*" Even if permission to go ahead is granted this summer, opponents could appeal and the process might continue to drag on.

There's an alternative to making barns into condos and boutiques. You can turn them into museums, as has been done to good effect in Vermont, Virginia, Massachusetts and a number of other states. In the early 1970s, Wisconsin's historical society began work on what may be the most ambitious project of all—a 576-acre museum of early ethnic farm buildings. Located in a hilly state forest 35 miles west of Milwaukee, Old World Wisconsin presently consists of nine reconstructed farmsteads and a typical 1870s crossroads village. In ways both subtle and dramatic, these barns and other buildings reflect the diverse cultural backgrounds of their builders—Germans, Norwegians, Danes, Finns and transplanted Yankees from the East.

I wish someone could have made a museum or *something* out of the barns I grew up with on the outskirts of a town not far from Old World Wisconsin. The Hart farm was just down the road from us; my brother and I used to toboggan on the hill behind that barn. The Price farm was across the way; I liked to visit their barn at milking time. The Gutzman farm was beyond the other two, at the foot of the hill. Al had retired from dairying by the time I started hanging around, but his barn had enough stuff in it to keep a curious kid occupied for hours. I never dreamed back then that one day all three of those farms would be gone. Subdivisions took care of the first two; a church eliminated the Gutzman place. When you drive out that way now, you can't even begin to imagine what it used to look like. You'd never know three families worked that land only a few decades ago.

This is why there's a special place in my heart for Karl Kluenker. Karl was only a year old back in 1920 when his father put up the main barn on the family farm a few miles north of Manitowoc, in the southeastern part of Wisconsin. The building became Karl's playground, his workplace, his prized possession, but after selling off his dairy herd some years ago he didn't have much use for it except as storage space. Recently he spent $7,000 to fix it up anyway.

He excavated the north side, anchored the sagging foundation, replaced the wooden floor joists with steel beams, replaced the windows, and had a painter give the building and its distinctive concrete silo (see cover) the works. All this despite the fact that he and his wife, Dorine, had no idea how much longer they would be staying on the place.

When he took me through his refurbished building last summer, Karl mentioned that he'd been battling cancer for several years. "There are some things," he said, "you can't fix with a hammer." That ordeal had made him think about the things that really mattered in his life, and the barn was one of them. "I'm sure glad we fixed it up," he said softly, glancing around the nearly empty hayloft. "It means a lot to me. Someday maybe it will mean a lot to the people who drive by on the highway and see this nice old dairy barn sitting here. Maybe then they'll point it out to their children and say, 'Look! That's what barns were like way back when Grandpa was young like you.' "

Karl passed away not long after I visited him. Dorine says he seemed to be holding his own until he took a turn for the worse, and after that he went downhill quickly. And so that beloved barn of his, the barn his father built and his own children grew up with, that handsome red barn sitting proudly by the side of the road where everyone can see it, has turned out to be a memorial not only to farming in the old days but to Karl Kluenker himself. I'm sure he knew it would be, when we were holed up in there gabbing away at each other on that sunny summer morning, and I think he felt pretty good about it, too.

Dorine Kluenker holds a cat on swing in hayloft of old-fashioned dairy barn her late husband fixed up.

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BUILT FUN TOUGH

By William H. Jordan jr.

They move, they roar: dinosaurs are here once more

An ex-pilot harnesses scientists and artists to re-create the lords of an ancient age, but the robots raise questions for our own

It's hard to make a dinosaur work. For one thing, the eyes sometimes roll before the lids close, which makes for a weird-looking wink. For another, the levers and pistons tend to wear at different rates so that the legs and body are out of sync. This makes for spasms. In damp climates the skin can get gummy and tacky and stick together, and that's if cracks don't appear in the creases where the skin flexes. The air hoses can leak. The electronics can short out. And always there are those quiet but nagging little puffs and wheezes and clicks as the air valves open and close, the pistons squeeze out air, and the eyes flick back and forth. It is not easy to make a dinosaur work, not easy at all.

But then it's a lot harder to make a dinosaur in the first place, and that is what this story is about—a unique company called Dinamation International Corporation, which manufactures robotic dinosaurs in Orange County, California, and sends them in traveling displays to museums around the world. It's a story about the process of creation in which scientists, engineers and artists actually cooperate, and it is a story about the philosophical ironies that dinosaurs and robots lay open for contemplation. "Dinamations," to stretch the company name, are monuments to technology and dinosaurs are monuments to extinction—which brings technology and extinction face-to-face.

The story of Dinamation International must begin with its founder and president, Chris Mays, who in 1982 decided to find a new career. He had flown commercial airliners for 20 years, he was 47 years old,

This scarily lifelike *Allosaurus* confronts drivers in Southern California as it returns from paint shop.

The effect would be even worse if the robot were activated, moving around and making suitable noises.

Photographs by Peter Menzel

Dinamation's Tom Stifter (left), Chris Mays (center) meet with Joe Hithe in the model and art department.

Working from the inside, Richard Six grinds rough edges off the steel frame of a nearly completed robot.

his three sons had grown up and the friendly skies had become boring. His whole life had been flying; he had joined the Navy at 22 and had flown attack aircraft for ten years before joining TWA. But he had the confidence to start over in life—landing on aircraft carriers had given him that—and he has the ability to lead people in a direct, gracious way; this may have something to do with being one of 14 brothers and sisters. Above all, he has a voracious appetite for learning.

Enter the Japanese dinosaurs. Mays had seen robotized dinosaurs on public display in Japan. He had also learned that some of them were for sale, having served their purpose in various festivals. He mentioned the matter to a neighbor named Tom Stifter, who had experience in business and marketing. Why not import them for resale? suggested Stifter.

It seemed like a good idea, or at least half of one. The other half was where to sell them. Museums were the logical choice, but in the early '80s funding was being cut and none could afford to buy dinamations. Besides, what evidence was there that people would accept mechanical dinosaurs? The questions were answered by one of those serendipitous moves that some people just seem destined to make. The Los Angeles County Museum of Natural History was having a patrons' banquet and Mays offered to donate the presence of a half-sized *Triceratops* to provide ambience, which it did, looming behind the service of a formal, multicourse meal. The idea of joint-venture exhibits soon evolved and Dinamation International was in the business of sending displays to museums in return for part of the proceeds.

The exhibits have been a sensation. Attendance jumps 3 to 15 times; it is not unusual for a museum to

attract as many visitors in one to three months as it normally would see in an entire year.

The dinosaurs, however, are not the same as the original Japanese prototypes. Their appearance is far truer to the scientific facts and they are far more sophisticated in their mechanics. Nor is the company restricting itself to dinosaurs. With eternity as its territory, Dinamation intends to romp through the eons at will, and to date has manufactured woolly mammoths, saber-toothed cats and giant ground sloths, as well as a series of futuristic animals based on the optimistic assumption that mammalian evolution is going to go on for a few more eons. Prehistoric whales, sharks, plesiosaurs and other creatures are in production, and plans are in the works for exhibits on giant insects, endangered species and earthquake mechanics.

Dinamation is a corporation dedicated to more than profit. It is a company with a mission. It wants to promote education and, with it, certain values.

"Why not give something back," says Mays. "I saw Dinamation as fulfilling some pent-up frustrations I had about people who have become the heroes of today. Primarily they're created by the media—they're rock stars, they're pampered and drugged-up athletes, the list goes on and on. Why in the world are those people heroes? What I want to do is turn our scientists and our teachers and our creatures into heroes. Let us make education fun, make it a participatory thing. Everything we make at Dinamation has been scrutinized for what it can bring to the public."

The Dinamation staff feels confident that dinosaurs can be used to teach any aspect of science. There's no doubt that the exhibits stimulate interest, which is not at all dampened by the hands-on displays. In one of the most popular, panels of skin have been stripped from the body of a *Dimetrodon*, an ancient ancestor of dinosaurs with a dorsal sail like a sailfish, exposing the inner, robotic workings. A control panel operated with a joystick allows children to make the mouth open and close, and the head, legs and tail move while the pistons stroke and the levers crank.

Mays' interests, however, go far beyond museum displays. Dinamation bankrolls paleontological research and sponsors dinosaur-digging expeditions for lay people. It has coproduced "Dinosaurs, Dinosaurs—A Mesozoic Musical," which is performed in museums

Awesome even when still in pieces, dinosaurs of all sizes and shapes await final assembly on factory floor. In the foreground, artisans insert yellow fins (piled on table) along the backbone of a green *Stegosaurus.*

In what looks like a dentist's nightmare, workers glue the tongue into the head of a toothy *Tyrannosaurus.*

Eric Hvinden adds sound effects to computer program that will control the movements of this *Triceratops.*

by an actor named Slim Goodbody; helped found a dinosaur museum in Grand Junction, Colorado; and is starting to publish a quarterly magazine, *Dinosauria*, devoted to dinosaur paleontology. Unafraid of the far out, the company is putting together a serious scientific expedition to explore the Lake Tele region of the African Congo. For years rumors of strange, giant creatures have come out of the swamps, creatures that sound as if they could be dinosaurs. If the expedition were to photograph, or even bring one back, well, what an exhibit that would make.

The flowering of the Dinamation philosophy occurred after the company decided to manufacture its own creatures. Mays and Stifter set up shop in the most appropriate place: Southern California, land of dreams. Creation starts with the paleontologists who decipher the fossilized archives of the eons. Paleontology is a sort of forensic biology and it has come of age in the past 20 years. With an ever-growing catalog of devices and methods, these students of the dead are conjuring up more and more skin and flesh, and placing it back onto the bones of ancient creatures.

Nor do they stop with the physical form. How did they make their living? What did they eat, what kind of land did they live on, did they care for their young, were they social, what kind of groups did they travel in, were they warm-blooded, how did they reproduce? All the information that any biologist would want to know about any living animal is what the forensic biologists are seeking.

The internal structure of the bones suggests that at least some dinosaurs may have been warm-blooded. Stones in the stomach cavity indicate that some pulverized their food not with teeth, but with rock-loaded gizzards. The grooves and scars on the teeth of a predator indicate whether it chewed on bones. The bones reveal the kind of teeth by which they were chewed. But the tracks—there lies drama! A field of fossilized footprints in Texas has recorded a herd of *Apatosaurus* traveling along a river, huge adults, male or female, guarding the perimeter, the calves assembled inside the adult barrier. Skirting the giant herbivores are the tracks of an *Allosaurus,* a 45-foot predator, waiting to strike.

Making a dinamation requires all this information and more, in particular the internal anatomy, and even here it is amazing what the bones can tell. How much weight was the skeleton designed to support? What kinds of motion could the bones articulate? Where were the muscles attached and how large were they?

To meet these standards Dinamation retains a Who's

A biologist turned writer, California-based William H. Jordan jr. wrote on racing solar cars across Australia in the February 1988 issue.

Who of paleontology. The board of advisers lists such luminaries as Bob Bakker, adjunct curator of paleontology at the University of Colorado; Harley J. Armstrong, curator of paleontology at the Museum of Western Colorado; and George L. Callison, professor of biology at California State University Long Beach. If they are not enough, the company brings in whatever other experts are needed. Callison, a specialist on small dinosaurs, is also Dinamation's science adviser and thus has continuous influence as the creatures emerge from the drawing board, the machine shop, the sculpting studio and the molding area.

After 12 to 18 months of research, a new creature is ready to meet its makers. This occurs in a "new creatures meeting," and here the vastly different minds meet: scientists and engineers versus artists and sculptors. It is the central interaction in the creation of a technological dinosaur.

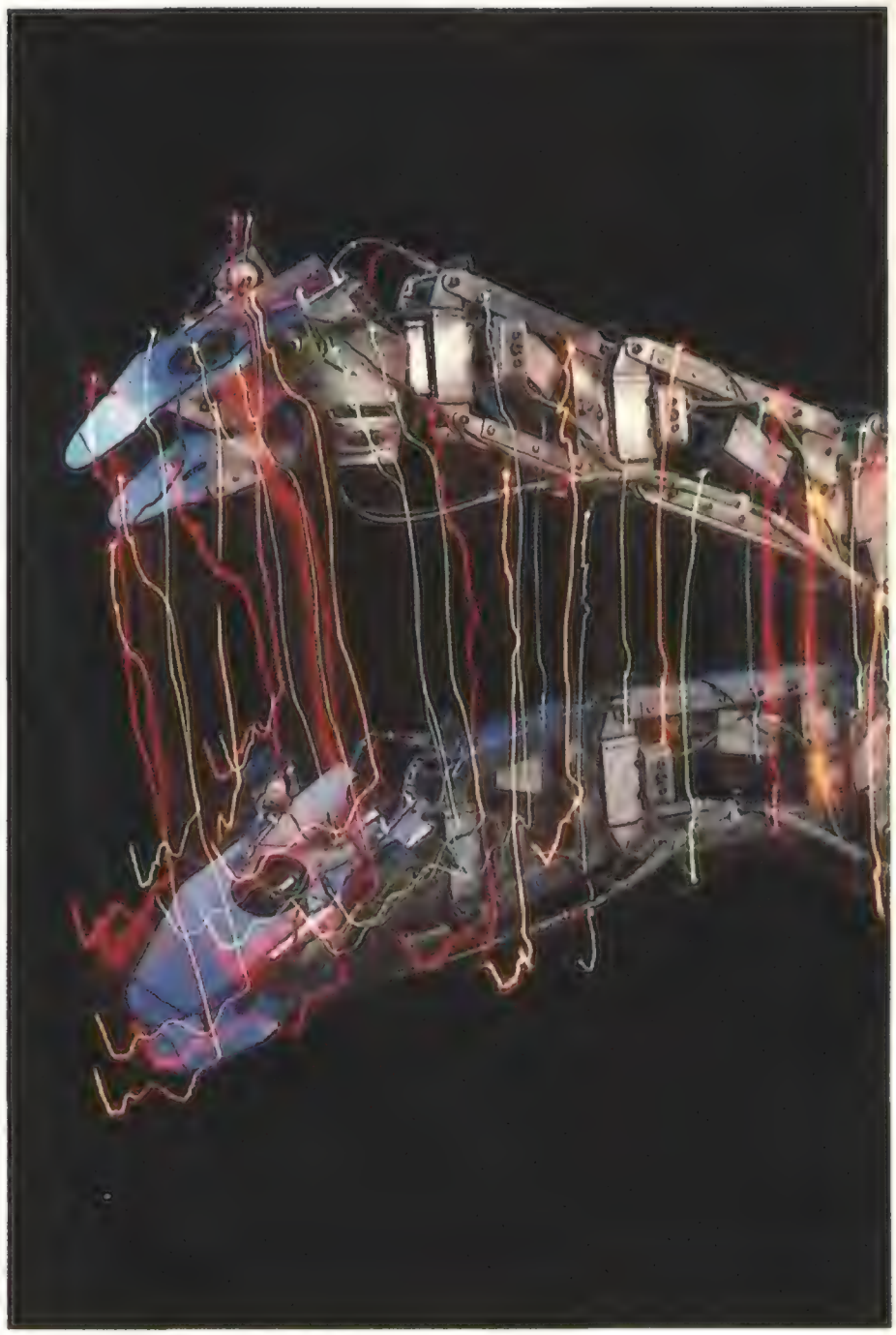
Finding a path for natural opposites

In an ideal world the artist would create entirely from his imagination—pure creation. The scientist would acquire all facts possible to know on the issue—pure reality. When the two minds converge, the instinct of the scientist is working at direct odds with the instinct of the artist. The scientist, if he had his way, would bring the dinosaur itself to the meeting and present it to the artist, reducing him to the role of mere illustrator.

In reality, neither artist nor scientist can follow his bent. Dinosaurs come in such an incredible range of sizes and shapes, and are loaded with so many odd extras (bone-helmet skulls, trombone-crest horns, radiator spinal plates, thumb spikes and so on) that not even the wildest imagination can outdo them. And for all their forensic skills and all their technical expertise, the scientists still have just the bones, tracks, eggs and a few skin impressions to work with. They need the artists to make a dinosaur come alive.

George Callison explains what actually goes on in the meetings: "We talk about tongues and the color of tongues and how the tongues moved. We talk about lips and skin and eye colors and the size of muscle mass, and all kinds of things that scientists never spent much time thinking about before because they're not needed in classifying dinosaurs. It's a whole different thing, trying to create lifelike animals out of rubber skin and fake hair and tubing and metal."

So, at a new creatures meeting, Callison or Bakker or some other scientist leads off with speculative facts about the animal under consideration. The plesiosaur, for instance, that long-necked, snake-headed, four-flippered dragon of the Cretaceous oceans, appears able, from its bones, to have moved its neck mainly in the horizontal plane, not in the vertical. This means it



Time exposure shows how head, neck of *Apatosaurus* (with skin removed) responds to joystick commands.

Aubrey Hendricks (left) and Megan Rutherford try their hand at controlling the movements of a dinosaur.

could not have arched its neck the way it has always been depicted, and must have bowed it instead, like a snake coiling to strike. But it was a long neck and the chief engineer makes a practical point: How do you get the skin to adhere to the metal without bunching while the creature cocks for the strike?

Another animal under consideration is a strange marine fossil known as a *Pterygotus.* It was flat as a wafer, maybe five inches thick, but six feet long. It looked like a scorpion with pincers and jointed legs, and the latest thinking has it swimming like a crab, sculling itself along with a paddle on either side, using its tail as a rudder. The banter of how to build it goes on endlessly. "We could cast it in sections," says one of the engineers, "then fit them together so they overlap."

"Yeah," says a sculptor, "but the color should be cast in the material then, so it doesn't wear off where the edges rub."

The robotics engineer points to the diagram of the tail and says, "Does this mean it has a range of motion of about 60 degrees?"

"Yes," says one of the scientists.

"How about translation?" asks the robotics man. "Is there a sideways translation in the tail? And if so, how much—about 5 degrees to each side?"

"Yes," says the scientist.

"Well, this might not be as tough as it looks," says the robotics engineer.

After the new creatures meeting, the project goes to the sculpture and engineering departments. While draftsmen draw blueprints for the internal robotics, artists bring the fossil to life, first in detailed anatomical sketches, then in a clay maquette. The detail on these miniature statues is exquisite—the wrinkles around the eyes so precise, the wrinkles on the skin so realistic, the expression on the face so convincing that if they began walking around the room, you'd just assume they were pets. Little woolly mammoths, *Triceratops, Stegosaurus, Tyrannosaurus, Diplodocus*—they stand on tables, walk across benches, lurk on filing cabinets around the sculptor's room—each representing a new dinosaur in miniature.

Before the real work begins, Guy Angelo Wilson gives finishing touches to a clay model of an elasmosaur.

A full-size or scaled-down statue is now sculpted of clay. If the original creature could have fit into a long-distance mover's 18-wheel van, Dinamation builds a full-size model; *Allosaurus, Deinonychus, Dimetrodon* are some of these. If the dinosaur would have been too large for the van to accommodate, such as *Apatosaurus, Stegosaurus* and *Triceratops,* Dinamation builds a scaled-down version. In the case of *Tyrannosaurus rex,* it seemed best to build a full-size head and not even attempt the body, since the head and teeth represent the animal's business end.

Next, a skin of urethane foam is molded in sections from the clay statue. So are the "plates." Plates are made of fiberglass or some other rigid, lightweight material and, when assembled, create the "plucked chicken"—the dinosaur's body—over which the skin will be laid.

Running the robots on compressed air

Meanwhile the engineers are busy designing robots that will operate within the skin. When a leg retracts, you cannot have a lever protruding backward or upward as a lump under the skin. The joints should articulate smoothly, without mechanical shifts and jerks. The robots run on compressed air; all the pistons, levers, air tubes and electrical wiring must be completed before the skin and the robot are "married."

The marriage itself takes at least a day, since it includes such tedious but crucial tasks as getting the eye holes to fit precisely over the eyeballs and padding out any saggy areas of the skin from underneath.

Then comes the matter of programming the creature's actions, including the sounds it will make: they are whatever Homo sapiens can rationalize, for fossils are mute. The programmer takes the snarls, roars, coughs and yowls of today's tigers, anteaters, alligators and so on, runs them through a digital sound system, and lo, the utterings of dinosaurs.

For behavior the programmer borrows from the actions of living animals because if you imitate the living, you get the illusion of life. A typical program runs three or four minutes, which is long enough to give the impression of a continually emerging drama, not the repeating loop it actually is. The scene usually begins in domestic tranquility, a *Triceratops,* say, browsing quietly. Suddenly it senses something. Its head jerks up. It sniffs the air. It flicks its eyes back and forth. It

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Debbora Hays paints face of partly disassembled *Dimetrodon.* Javier Villa spruces up the sail with an airbrush, while Javier Zepeda works out brush at the bench. Remaining parts will be painted as the creature is put back together for final tests.

steps menacingly forward. It throws back its head and roars. (Little children watching this happen cling to their daddy's legs. Some burst into tears. Others laugh hysterically.) Then, with its foe sufficiently intimidated, the dinosaur goes back to its peaceful feeding.

Once the program is composed and installed, the dinamation is turned on and allowed to run for 40 hours or so to show up any glitches and any weak points in the skin. The robot has to be tuned. Thirty or 40 valves have to be adjusted so that air is piped at just the right instant to the pistons that move the legs, eyes, mouth and other parts.

Eventually the creature is ready for the final touch: painting. It is lifted onto a stake-bed truck and hauled across town to Dinamation's painting facility. There a crew of artists applies the stripes and patterns and colors that seem plausible in light of living birds and mammals. Again, the illusion of reality.

When the paint is dry, the new creation is shipped back across town to the Dinamation factory. The effect on the good motorists of Southern California is noteworthy, as a full-grown *Allosaurus* rides along on a flatbed truck, mouth agape, suggesting to those behind that tailgating is not a good idea.

Now it is late in the afternoon and the Dinamation factory is nearly deserted. Dinosaurs crowd about on the factory floor. A half-assembled *Allosaurus* stands there, a cable hanging from its eye socket like the optic nerve it is. Leg skins are pulled loosely up over its calves and left open at the top like rubber waders. Next to it sits a gigantic, life-size bust of *Tyrannosaurus rex*, as big as a golf cart. You gaze incredulously at the 3½-inch eye, which gazes back at you. You measure the 6-inch sabers it carries for teeth. Next to it, a *Triceratops* comes to life. Its eyes flick back and forth, sizing you up. It takes a step forward. There is real menace in its look. Muscles seem to move beneath the skin. The massive body, the grotesque horns, the giant beak, the little malevolent eye. Something clicks inside your head, some neural circuit, and for just an instant you are in the Cretaceous, 70 million years ago, a prehuman world. With the full shock of reality you finally comprehend how alien to mammalian sensibilities these creatures are—how magnificent—how formidable—how extinct.

Reality then reasserts itself. The *Triceratops* moves its head in a series of subtle mechanical jerks. The valves click. The pistons puff like miniature air brakes. A leg steps back. An eye flicks backward with a knocking sound. Before you stands a robot invested in a mannequin.

Superb as it looks, you feel a hollow yearning as you gaze on it. You know that no matter how much the paleontologist translates from the fossil archives, the actual details—the unique, incomprehensible touches of life—will never be attainable. They are simply not there. As for the human imagination, well, that is just a pale, dim flicker confined under the bell jar of what we know of the living. The mind cannot conjure up with any certainty those actions and patterns and sounds of the alien deceased. Who could predict from the ant suspended in amber the social kingdom of its

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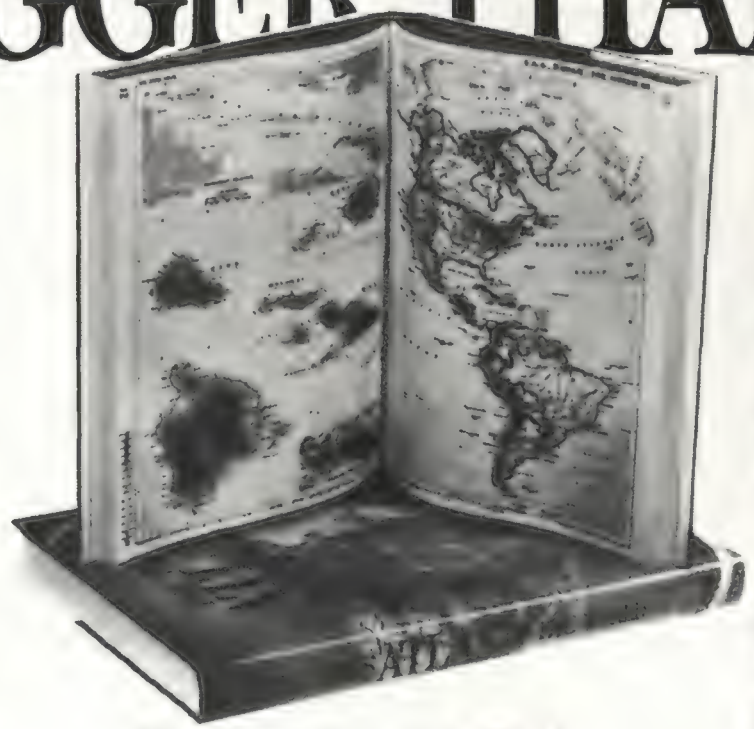

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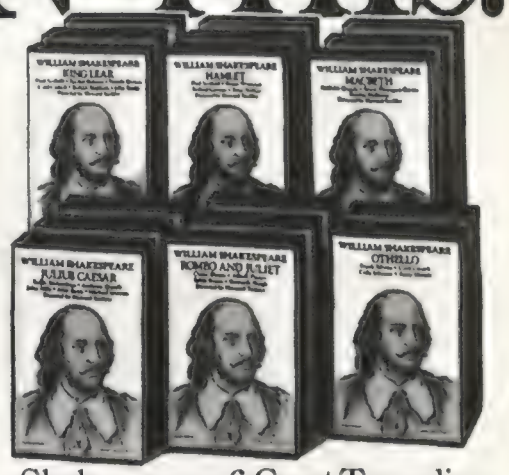

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Dallas museum visitors and a winged *Pteranodon* watch three *Deinonychus* tear apart a *Tenontosaurus*.

species? Look at the adornments that make a camel a camel, a mandrill a mandrill, a man a man, a woman a woman or, for that matter, the mounds of flesh that make a fat man fat. They leave not a molecule of evidence behind in the rock. When you come to the skeleton of *Tyrannosaurus* or *Stegosaurus*, or the skeleton of any ancient animal, you can only wonder what fins, what folds, what feathers, what inconceivable ornaments of color and flesh completed that creation. What impulse, what thoughts, what desires must have coursed through its tiny brain? We don't have a clue, nor shall we ever.

The workers are going home now, the dinosaurs are being turned off for the night and an odd thing begins to happen. Alone in the room, with no humans but yourself, the creatures come alive in the mind's eye. It's as if the spirits of the dinosaurs, in limbo these past 100 million years, have returned to try out a new incarnation and, in the mechanical carcasses of these teaching devices, want to tell us something about the ways of time and evolution. You look across the floor, across the eons, across the abyss of extinction, and the messages are imparted silently to your mind.

The first is this: gigantism goeth before a fall. In the endless course of evolution, animals have become very large many, many times. The ancient placoderms and fishes, the amphibians, the reptiles, even species of insects all had their go at bigness; it is usually associated with success. And then something happened and these very large, very successful creatures became extinct. I found myself thinking that these mechanical dinosaurs were saying in their silent, looming way that the human brain and its product, the mind, is a kind of gigantism. If you could make the conscious mind physical, give it a shape and a form, make it into a body, you would have a world of creatures far more bizarre than the most extravagant dinosaur. The ability to speak, to calculate and to think science, to dream and set goals, to cheat and lie, bear grudges, carry guilt and remorse—this wonderful array of abilities represents the ultimate in mental evolution. Add to it the stupendous range of minds within the one species—physicists and athletes, musicians and ditchdiggers, popes and mass murderers, thieves and psychologists—and you have not necessarily the pinnacle of evolution but rather, perhaps, an extreme branch off to the side. Gigantism and extinction: something to think about, sayeth the dinosaurs.

This is especially true when geological time is taken into account, I sensed the dinosaurs telling me. The physiology of Earth beats to the rhythm of eons as they swing between rivers of ice, tectonic collisions, asteroidal conclusions. The time scale is incomprehensible to a human mind.

The fossil archives help a little, though, in getting some perspective. For instance, the smallest unit of time the fossils can resolve is about 100,000 years; events that happen closer together cannot be separated. That means that if an alien race were to land on Earth 65 million years from now, it would not be able to tell from the fossil record whether Christ arrived before the computer or after it, or whether Neanderthal man arose before the nuclear age or after it, which would make a lot of sense. In fact the entire span of human history, a puny 12,000 years, would be flattened into one subatomic flash. The environmental impacts—holes in the ozone layer within a 30-year span; three billion people added to the population since 1950; a greenhouse warming of the planet in a hundred years—on the fossils of the future will all appear to be an instantaneous burst, indistinguishable from the impact of an asteroid. Human civilization will appear to have sprung up all at once—imported, no doubt, from some other spoiled, soiled and de-oiled planet.

As you leave the Dinamation factory and walk out to your car, you join the countless hundreds of millions of your species in a tribute to evolution and extinction, and now to technology. You reach for the ignition and turn it on. The engine leaps to life: gasoline courses through its veins. Gasoline, a liquid extracted from ancient life. Industrial civilization, a monument raised to the glories of extinction.

Science, art and engineering come together in a fierce *Allosaurus* that looks ready to rip its prey to shreds.

Photograph of a cowboy in full regalia, believed to be rodeo star Bill Pickett, is on display in the museum.

Stewart and wife, gospel singer Johnnie Mae Davis, exchange smiles in front of the couple's Denver home.

By Evelyn C. White

How Paul Stewart mines lost 'gold' with a tape recorder

Founder of the Black American West Museum, this self-taught historian is uncovering a rich vein of our nation's past—and sharing the wealth

"Testing, one, two, three, four. . . Now would you tell me your name and when you were born, and where?

My name is Evelyn Lucille Parker Napper and I was born July 25, 1914, in Barnum, Colorado. Grandpa Henry Parker and Grandma Laura came to Denver in a covered wagon [in the 1890s]. They brought old pieces of furniture, Blue Willow china, a grandfather clock and a chair with an ivory elephant on it. And a piece of gold, too. Laura always wore long black dresses—handmade. They had a paper to a mine and Grandpa had a very old gold watch—all of these things disappeared. . . . They later opened a rooming house for miners in Idaho Springs. . . . Grandpa went out with this white man and they found two silver mines, one was the 'Big Brown Jug,' the other was the 'Little Brown Jug.' My mother told me that afterward [their four sons] divided the claim—tore it up into four parts—that's the end of that story as far I know. . . . When they first came to Colorado, Henry Parker was a blacksmith; he lost his finger doing that kind of work. . . ."

—From an interview by Paul Stewart

They met when Paul gave a talk on black women pioneers at a church event where Johnnie Mae sang.

Poet Paul Laurence Dunbar, one of the first black writers to gain wide fame, wrote for a Denver paper.

As a child growing up in the clangorous steel town of Gary, Indiana, I hardly ever thought about people who lived in the West. But when I did, my mind raced instantly to TV's Lucy and Ricky Ricardo and their visits to Hollywood, and after them to my Los Angeles cousins, who drove to Gary every summer in a brand-new Cadillac. Oh, they were exotic creatures, those Clayborn relatives of mine. And although they were black, I was certain my cousins lived a madcap California life just like the Ricardos did in *I Love Lucy*. I could imagine Aunt Vivian and Uncle Sonny watching the sun dip into the Pacific from the balcony of a beachside apartment. Down below, their car would be ready to whisk them off for a night of dancing to the sultry sound of maracas and other instruments unknown in Indiana. Whether people were black or white, real or imagined, I believed folks from the West did outlandish things. They lived wild, unpredictable lives.

By the time I arrived in Denver recently to visit Paul Stewart, founder and curator of the Black American West Museum, my ideas about life in the West had evolved a bit. Like most other American children, I'd learned a little about frontier days in school. Through books and TV, I'd been introduced to Wyatt Earp, Geronimo and the sharpshooting Annie Oakley. But it had never occurred to me that blacks, my ancestors, might have driven cattle, ridden in wagon trains—or thrown a few roundhouse punches in those raucous saloon brawls I'd watched with such glee on television. Or that they might have been some of the soldiers, teachers, lawmen, laborers, preachers, doctors and dentists who'd had a hand in settling the West. I had no idea how little I knew about the pioneers.

Stewart, 63 and twinkly-eyed, met me in my hotel lobby, not wearing a business suit as I had expected but, rather, resplendent in Stetson, crisp jeans, black leather vest, red neckerchief, checkered shirt and spit-shined cowboy boots. Smiling and tipping his hat as he said hello, his Western aura was totally authentic: I fully expected to find a horse hitched up outside the door. "Paul always liked to wear Western-style clothing—he just needed a wife to show him how to put it all together," gospel singer Johnnie Mae Davis joked to me later. She has fine-tuned his "cowboy look" since

Color photographs by Barry Staver

Of a cowboy's buffalo coat, Stewart says he tried wearing it in a Utah winter "but sweat poured down."

corralling him nearly two years ago: "There aren't too many grown men who can walk around dressed like a cowboy and carry it off. But Western culture is really in Paul's blood—he's presenting an image of something that means a lot to him."

The way Stewart sees it, "So much of black history has been overlooked for so long, it's not surprising that most people are unfamiliar with all but the most celebrated events and figures." But instead of wringing his hands, he has put them to work collecting the memories and memorabilia of black pioneers. The museum is considered the foremost source of historical materials and oral histories of blacks in the West and, for me, visiting it was like being let in on a wondrous secret.

My host speaks and moves with near evangelical fervor when showing off the homey museum at 608 26th Street in Denver's Five Points historic district, a vibrant, largely black neighborhood nestled near downtown skyscrapers. The exhibit area, offices and a room for community events occupy 4,000 square feet in the basement of a newly restored red brick building. The first of two galleries showcases blacks in the West during the 19th century; the second displays artifacts of blacks who contributed to early Denver history. Visitors may touch burnished saddles and jangle old spurs instead of just peering at them through glass.

Leading me into the first gallery, he draws my attention to an oil portrait of "Old Pete," a former Buffalo Soldier. In 1866 Congress established two cavalry regiments of black enlisted men. They were called on to help win the West from the Indians, Mexican bandits and outlaws like Billy the Kid. "The Indians called them 'Buffalo Soldiers,'" Stewart explains, "because they were tough and their hair reminded the Indians of buffalo fur—and the name stuck. The buffalo was sacred to the Indians, so some historians believe the name was also a term of respect."

"Your dad was real tall? About six feet?"

The vast knowledge of people and places, dates, events and, above all, connections that Stewart brings to his oral history collecting would put a talk-show host to shame. Listening to a 1977 taped exchange with Amanda Davis Gordon, daughter of Buffalo Soldier William Davis, I hear a genial conversationalist who pries with purpose, skillfully leading the witness: *"Can you tell me when your father was born?*. . . He was 10 years old after the war. He wasn't old enough to go into the Civil War. But he went into the Regular Army that was training them to fight the Indians, which I hate to say. He said, 'Don't say "fighting the Indians,"' because that didn't sound right . . . because he was a Choctaw. His mother was a colored and his daddy was a Choctaw. *Oh, I see*. . . His daddy disappeared and he

always believed that they killed his daddy. . . He went in [the Army], and they were, he called it, 'clearing up the country.' *Yes, and I guess they were pushing the Indians onto the reservations.* . . That's right. . . The 10th Cavalry. . . I never will forget it, because he could blow the taps. . . He rode a horse; he said that was the finest horse that ever roamed the West. *Your dad was real tall? About six feet?* Real tall, and broad-shouldered, straight as an arrow; you had to look up at him. *Is that right? Maybe, you know, that was the Indian in him . . . I'm part Cherokee . . .* "

Near the Buffalo Soldier's portrait hangs a gigantic mass of brown fur. "Look at this—this buffalo coat belonged to Walter Jackson. He wore it summer and winter," says Stewart. "He is believed to be the first black man born in Montana Territory." Born in 1887 and orphaned 13 years later, Jackson drifted from one Montana town to another, working as a ranch hand. When he couldn't find honest work, he kept company with bank robbers, horse thieves and sidewinders of the lowest order. About 1913, Jackson settled in the desolate plains near Sheridan, Wyoming. Longing for female companionship, he responded to a newspaper ad for mail-order brides; a New Jersey-born black woman was soon dispatched. She reputedly managed her new home and husband with an iron fist, forcing Jack-

Portrait of former Buffalo Soldier "Old Pete" was done by artist C. D. Jackson, for whom Pete worked.

In corral-like exhibit, objects used by Colorado homesteader Charlie Rothwell include rope and saddles; scales for weighing hay; rifle and pistol holsters; spurs; small anvil for making horseshoes; a two-man saw; Navajo blanket; hat; coffeepot with two-foot handle, for use over a campfire. Framed picture is of Rothwell's mother.

son to stop mixing with shady characters. "Walter lived a pretty rowdy life until his bride settled him down," Stewart says in a tone suggesting empathy with Walter. "When he died in the 1970s, his friends brought the coat down and gave it to me."

Like other curators, Stewart has used social and business contacts to help acquire many of the 35,000 items in the collection. But he got hold of the first of the six-shooters, wagon-wheel wrenches and other artifacts while styling Afros in a Denver barbershop.

As a member of one of the few black families in Clinton, Iowa, Paul Stewart grew up in the midst of adventurous, freethinking pioneers. His grandfather was a disciple of Marcus Garvey's Back to Africa movement. His father, he says, was the only black in Iowa known to have owned a trucking company during the Depression. A high school trumpet player who idolized Louis Armstrong, Stewart joined the Navy after graduation. When his tour was over, he and his brother Eugene moved to Evanston, Illinois. They sorted mail at the post office and took night classes at Roosevelt University in Chicago. "With both of us trying to make it through college, there wasn't much money to go around," he recalls. "I decided to drop out and help Eugene with his expenses. So I became a barber, figuring it was a skill I could always fall back on."

Stewart barbered here and there, eventually returning to Evanston. In the early '60s he traveled to Denver to visit a relative. "My cousin was showing me around town one day, when I spotted this black man standing on a street corner. He was wearing full cowboy regalia—boots, chaps, gun belt, spurs, cowboy hat—I mean everything. I said to my cousin, 'Look at that drugstore cowboy. Who's he trying to fool? Everybody knows there are no black cowboys.' "

But his cousin knew different. He explained that the man was a local rancher who had ridden herd for years. As Stewart listened in disbelief, his cousin floored him again, adding that there were lots of black cowboys in Colorado. "You could have knocked me down with a switch when he told me that man was a real cowboy," Stewart says. "I knew the Lord had sent me to the right place."

As a child, Stewart reveled in playing "cowboys and Indians," except for the days when he would proudly announce his intention to be a cowboy. "At that point my white playmates insisted, 'You can't—there's no such thing as a black cowboy.' Seeing that man in Denver had a big impact on me. For the first time, I realized the history books had deliberately left black people

From Kentucky, freed slave Clara Brown went West, worked and saved to buy freedom of friends, relatives.

Formidable "Black Mary" Fields was second woman ever to drive a U.S. mail coach; she always delivered.

Buffalo Soldiers wore Mason's collars and aprons for this portrait at Fort Huachuca, Arizona, c. 1915.

out. So that other children wouldn't have to go through what I did, I made a vow to find out everything I could about black cowboys. It became sort of a mission."

With a campfire in his belly, Stewart moved to Denver and opened a barbershop. As he styled the hair of the black menfolk, he questioned them about black pioneers they knew or had heard about. "Sometimes while I was cutting hair I would reach back and secretly turn on my tape recorder," he confesses. Soon he was actively seeking interviews, convinced that he had found his true work: "Many men say they've been called to preach; I feel like I've been called to do this—I feel that He leads me to places. I've gotten history that would have been long gone—I'll probably drop dead with a microphone in my hand."

The word quickly got out that the new barber on East 34th was interested in black Western history. People started bringing him old cowboy boots, miner's helmets and photographs of blacks in the early days. "I put up displays in the shop as conversation pieces, but I got so much stuff that I ran out of room," he says.

Determined to learn all he could, Stewart scoured the West, from the plains of Montana to California to the Arizona desert, in his quest for pioneers. Among those he discovered in his own backyard was Charlie Rothwell, a Colorado homesteader whose saddles, branding irons and other memorabilia occupy a museum tableau designed like a corral. Rothwell was among the first residents of Dearfield, an all-black farming community founded in 1910 by Oliver T. Jackson, a Boulder farmer and businessman. Jackson's mentor had been Booker T. Washington, who believed that agriculture and industrial trades were the keys to black economic independence and self-sufficiency.

"His fists were as hard as wood"

Rothwell raised horses, cattle, hogs, chickens and sheep on his ranch. One day he came home to discover white men from the Bijou Ditch Company illegally drilling for water on his land. They ignored his orders to leave, so he took matters into his own hands. Brandishing a gun, he riddled the drilling equipment with bullets, one of which ricocheted and grazed a worker. After a long court battle, Rothwell won his case, but the judge gave him a jail sentence for his role in the incident. "Charlie was just a tough old guy who wouldn't take any stuff off of anybody," says Stewart, who interviewed Rothwell several times before his death. "His fists were as hard as wood and he was always punching out people—he even sparred with Jack Johnson."

In Gunnison, Colorado, in 1975, during one of his cowboy hunts, Stewart discovered a trunk full of Ferdinand Schavers' belongings—including a badge that identified him as President Lincoln's bodyguard.

Watch, stickpin, card belonged to Ferdinand Schavers (at right), Lincoln's bodyguard from 1861 to 1863.

Schavers, here at home in Gunnison, Colorado, c. 1917, had gone to Denver in 1879 as a Pinkerton detective.

Schavers escorted Lincoln to meetings, cut his hair and did other personal tasks for him from 1861 to 1863, when he became a recruiting officer for the Indiana Colored Regiments. He later moved to the Denver area as a Pinkerton detective. Stewart points to Schavers' gold pocketwatch, jeweled stickpins and calling card. As I watch the light dance off the emerald and diamond stickpins, I wonder how many other people remain to be discovered—unknown black Westerners who've done exciting things.

Dreaming of opening a real museum, Stewart moved the ever-growing collection from his barbershop to an old Denver saloon in 1971. But urban renewal soon forced him to find a new home for his treasures, this time a donated room on the Clayton College campus in Denver. By then incorporated and with a board of directors, the museum stayed at Clayton for nearly a decade. Johnnie Mae remembers that era of the museum's—and her future husband's—history: "Paul and I first met at a church event where I sang and he spoke about black women pioneers. He gave me his card and invited me to visit the museum. One day I went out to the school, but I couldn't find the museum. I asked a bunch of people about it and got blank stares, so I threw his card back in my purse and went home."

Because Johnnie Mae's experience was typical, the directors rented the larger and more accessible Five Points facility in the mid-'80s. What most pleases Stewart and the museum's supporters is that the district has a rich black cultural heritage. "During the 1940s and '50s, this was the hub for blacks in Denver," says Edward Gordon, who works part time at the museum. "All the big jazz bands, like Duke Ellington's and Count Basie's, would come here to play. Now, the entire area is being rejuvenated by the city and the museum is contributing a lot to the community."

Owner of the Petal Shop in Five Points for several years, florist Tommie Dotson has been an eyewitness to changes. She agrees that the museum is helping the place rise up from the decay that set in during the late '60s: "It is definitely an asset. I see people going in and out—and lots of school buses. Even though I knew not all blacks were slaves, before the museum I had no idea what they did. The most exciting thing I learned is that they weren't all poor—some owned property."

And some were also entrepreneurs, such as the directors of the Golden Chest Mining, Milling and Tunnel Company: physician W. J. Cottrell, newspaper editor C. A. Franklin, clergyman J. E. Ford, former state legislator G. C. Sample, miner Elias Stevens.

And there was poet Paul Laurence Dunbar, who moved to Denver for his health in 1899. During his stay he wrote for the *Denver Post.* And *Gone With the Wind*'s rotund Mammy, Hattie McDaniel, the first black person to win an Academy Award; her father, a minister, brought his family to Denver at the turn of the century. In Stewart's interview with Amanda Davis Gordon, he discovered that she grew up next door to the McDaniels: "I can remember her mother was very religious, and my mother was, too. I knew Hattie well. *And there was a sister?* Etta! *Yes, Etta! And she sang too?* Yes, Hattie could sing real good—so could Etta, and their brother Sam played the drums. They had a little show here in Denver . . . they started down at the Grand and found they could sing so good that people said, Well, why don't you go to Hollywood and make up a show and make money?. . . *Was Hattie's mother as big as she was?* About her size."

Evelyn C. White is a reporter for the San Francisco Chronicle *and the editor of a book on black women's health to be published by Seal Press next year.*

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A simple wagon wheel and two wagon-wheel wrenches (held here by museum aide) evoke the romance and hardship of a pioneer journey. Paul Stewart intends museum artifacts to dramatize the frontier life, for children especially. His joy, as he describes it, is "letting them know that we have taken our part in just about every facet of life in the West."

I feel like a child watching her first parade when Stewart shows me the memorabilia of rodeo star Bill Pickett. Pointing to a photograph of what appears to be a man kissing a cow, he explains that Pickett had been a broncobusting cowhand in Oklahoma in the 1890s and 1900s. "While working a roundup, Pickett noticed that cattle dogs could get wandering steers back to the herd by jumping up and biting them on the lip. So one day, when he was loading cattle on a stock car and an unruly longhorn broke loose, he decided to try it himself." Jumping on his horse, Spradley, Pickett chased the steer until he got close enough to grab it by the horns. Sliding off Spradley, he twisted the animal's head around and bit it hard on the lip. Overwhelmed by Pickett's cattle-dog tactics, the 800-pound critter scurried back to the stock car.

"That's how Pickett invented the rodeo art called bulldogging, or steer wrestling," says Stewart. Billed as the "Dusky Demon," Pickett performed his steer-biting feat for cheering Wild West show crowds from 1908 to 1916. Dying as theatrically as he had lived, he was killed in 1932 when a wild horse kicked him in the head. In 1977 Pickett became the first black man to be elected to the National Cowboy Hall of Fame.

The museum's rodeo mementos of Pickett are especially meaningful to the cowboys and cowgirls who tour the country nowadays in the Bill Pickett Invitational Black Rodeo, formed six years ago by producer Lu Vason to "destroy the myth that conquering the West was an all-white venture."

Rex Purefoy, who puts on a one-man Wild West show for the Pickett rodeo, stops by the museum while I am there. "This place is loaded, it's top of the line. There's not a collection in the country that rivals this. When I was a kid, all the boys wanted to twirl the pretty guns and put the outlaws in jail, just like we saw in the movies. But it was hard to really imagine because we never saw any black cowboys."

But as Stewart shows and tells it, thousands of blacks headed West after the Civil War as prospectors, cooks, stagecoach drivers and fur trappers. The stalwart black scout and trailhand Joshua Deets, in Larry McMurtry's *Lonesome Dove*, may be a rarity in Western literature, but in actuality blacks constituted some 25 percent of the 35,000 men who rode behind great herds of cattle during the Western drives of 1866-95.

Before the Civil War the West had been a political battleground for slavery. While some of the territories outlawed slavery, each determined the number of free blacks who could settle there and the laws governing them. In many places they were denied the vote and access to public schools. Often they couldn't testify in court or serve in the militia. Though blacks still suffered discrimination in the West, their fellow frontiersmen weren't nearly so consistent in enforcing the antiblack laws as slaveholders in the South had been. Out on the range, where peril lurked constantly in the form of rattlesnakes, Indian raids and unforgiving weather, bravery and skill could count for more than skin color—or gender.

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Hat, boots are from Charlie Brown, a Colorado cowboy of the 1980s. A bull threw him, tearing hole in hat.

Like Walter Jackson's no-nonsense bride, countless other black women played a vital role in settling the frontier. Having honed their survival skills during slavery, they rose to the challenge of building an independent life in the barren lands west of the Mississippi. In the museum I come upon a fierce photograph of Mary Fields, a gun-toting pioneer equal to any man in the West. Six feet tall and weighing 200 pounds, she was a legend in her own time. Born a slave in Tennessee, Fields went West in 1884 to haul freight for a mission in Cascade, Montana. She quickly learned to use a gun to protect herself and earned a reputation for fearlessness. In 1895, in her 60s, she took a job as a mail coach driver. Not weather, terrain or Indians stopped her stagecoach. At 70, she opened a laundry in Cascade; for relaxation she drank red-eye and smoked cigars with the men in the local saloon. "She earned great respect for the way she handled a business problem," Stewart chuckles. "She was unwinding in the saloon one day when she spotted a laundry customer who had failed to pay his bill. She sidled up to him, reared back and knocked the man down with one blow, put her foot on his chest and wouldn't let him up till he paid. From then on, her customers went out of their way to pay on time."

A laundry had long been a profitable business. In the 1850s, Clara Brown, a freed slave from Kentucky, came West on a wagon train full of gold seekers. Settling first in California, she laundered miners' shirts for 50 cents apiece. Through land investments and half-shares of strikes from miners she'd grubstaked, she saved $10,000, which she used to buy the freedom of friends and relatives still in Kentucky, and to help other blacks make the journey West. In a successful search for a daughter who had been sold away from her in slavery, Brown, now known as the "Angel of the Rockies," moved to Colorado, where she helped found a number of Methodist churches. Clara Brown's story, and those of others, have been told by Stewart in the books *Black Cowboys* and *Westward Soul.* Proceeds from book sales go to the museum.

Because the museum operates on limited state and private funds (about $44,000 a year), Stewart is not paid a salary for his work as curator. Since 1975, when he retired from barbering, he has been a consultant to the Denver public schools. Holster on hip and lariat in hand, he goes into classrooms to talk about black pioneers and to show slides. One afternoon, 20 third-graders and I watch and listen, spellbound. Wearing jangling spurs, leather chaps and a red bandana at his neck, Stewart embodies the cowboy he saw in Denver 20 years ago. As he describes shoot-outs and gamblers paying for whiskey with a pinch of gold dust, the children squeal with excitement. For his grand finale, he twirls a rope, then lassoes a group of giggling students.

Loyal Darr is the Denver school official who hired Stewart despite his lack of professional teaching credentials. I ask Darr if other educators resisted a "novice" bringing into their classrooms information that is not in the history books. "There were some who were skeptical of him at first," he replies candidly, "but after a while, they realized that Paul really knows what he's talking about and has documented what he's teaching the children. When youngsters know they are part of a group that has a history it does wonders for their confidence and self-esteem." And this is exactly what the man in the cowboy outfit aims to do: "My special joy is showing children pictures of people who have contributed, and letting them know that we have taken our part in just about every facet of life in the West."

Education being a two-way street, Paul Stewart has also learned a lot since his "cowboys and Indians" days in Iowa. "When I first came to Colorado I got some maps and went up into the mountains looking for gold," he reflects, standing happily in the midst of his collection. "But the gold I was looking for was not in the mountains—it was really the history of blacks in the West. This is the real gold mine."

At Denver school, Stewart tells of a stagecoach driver whose trigger finger, tangled in reins, got torn off.

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By Jeanne McDermott

A biologist whose heresy redraws Earth's tree of life

Lynn Margulis shows how nature's diversity has arisen by microbial cooperation as well as by traditional Darwinian competition

Each finger of "Gaia's hand" is a kingdom of life: from left, algae and kin, fungi, plants, animals, bacteria.

The first thing everyone notices about Lynn Margulis is that it's impossible to keep up with her. She dresses for comfort but her mind obviously thrives on work. She wears corduroy jeans and a colorful Peruvian sweater, a gift from one of her four children. She rises at 5:30 and bicycles to her modest book-lined office at the University of Massachusetts at Amherst before the rest of the campus awakens. "That's when I get my work done," she says. From 9 to 5, the quiet dissolves into a whirlwind of activity. Friends and colleagues have a shorthand way of acknowledging her prodigious energy. "Oh, you know Lynn," they say.

As the director of a $100,000-a-year research lab, she taught two or three courses at Boston University every semester for 22 years, and is continuing this work at the University of Massachusetts. She has authored more than 130 scientific articles and 7 books. She rarely sits still. Her speech is nonstop and, in the jargon of her profession, filled with references to DNA homologies, microtubules and antitubulin probes. She interrupts and digresses constantly because one idea triggers an avalanche of others. She likes to make daring statements such as, "The nervous system is explicable in terms of microbiology." "That's propaganda" is her way of dismissing dogma, which she hates. She is restless, passionately curious, irreverent, sassy and very sharp.

One colleague calls her the most gifted theoretical biologist of her generation. Another, of the century. "Her mind keeps shooting off sparks," says Peter Raven, director of the Missouri Botanical Garden and a MacArthur Fellow. "Some critics say she's off in left field. To me, she's one of the most exciting, original thinkers in the whole field of biology."

Margulis is an authority on the microcosmos. She likely knows more than anyone else about the role of microorganisms in the past 3.5 billion years of evolution. While most American biologists emphasize the role of competition in evolution, Margulis stresses symbiosis. For example, she views each human cell as a "sophisticated aggregate of evolving microbial life." We are made, if you will, of conglomerated bacteria.

As children, we gradually learn how the world works—china cups break when they fall, hot coffee burns, the sun sets at night. As any summer visitor to northern Alaska can attest, it can be very upsetting when the world does not work as expected. Scientists, likewise, build their own notions of the way the world works, which MIT philosopher Thomas Kuhn calls scientific paradigms. Periodically, but not very often, a scientist will make a discovery so outlandish that it does not fit into any paradigm, leading to a sort of intellectual earthquake or, in Kuhn's language, a paradigm shift. Margulis is one of the few living scientists who has shifted a paradigm.

Undaunted by the prospect of raising eyebrows among scientific colleagues, biologist Lynn Margulis has pioneered a once-radical theory in which different forms of Earth's life have evolved through symbiosis.

Photographs by Richard Howard

Grandson Tonio Sagan helps Margulis review *Wouldn't it be Weird?*, his father's book for young scientists.

"When I was an undergraduate, two theories were held up for ridicule, to show how farfetched scientific theories can get," says William Culberson, professor of botany at Duke University. "One was the theory of continental drift and the other was the symbiotic theory of the origin of the cell. Neither is laughed at today. The reason that the symbiotic theory is taken seriously is Margulis. She's changed the way we look at the cell."

Yet, Margulis has spent much of her career on the margins of respectability, battling the scientific community's lack of familiarity with the more than 200,000 known species of microbes on Earth, most of which do nothing that directly harms or helps the human race. "Microbiology was, historically, a practical art, not a science," she says. "You know, kill the germs and save the food." Only in the past ten years have science textbooks begun to reflect her views. Ironically, she herself has become the new authority. "It's worrisome," she says. "Depressing. Authorities change. The experience doesn't. When science is taught by reading a textbook, you open the door to dogma." Her students get their feet wet.

Despite her success, Margulis' work remains controversial. Hers is not the kind of work with which the scientific community can simply agree to disagree. "It's a question of changing your religion," she says. Academia rewards its brightest stars with a specially funded teaching position called a named chair. A few years ago, Margulis was on the verge of being appointed to a named chair at a major university but was not offered the position, though the possibility still remains. The antagonism stems, in part, from Margulis' collaboration with British chemist James Lovelock on Gaia, the hypothesis that the Earth acts as a self-regulating, self-maintaining system (*Phenomena*, May 1988). Gaia's most vocal supporters are ecoactivists, church groups and science fiction writers. To some establishment scientists, these countercultural associations make the ideas behind Gaia suspect. Ironically, Margulis is hard on Gaia's popular supporters. "Lynn is ferocious about going after mysticism," says Stewart Brand, founder of the *Whole Earth Catalog*. "New Age types are drawn to her and then she busts them high, low and center for being softheaded."

In a sense, Margulis challenges the American myth of the rugged individual—alone, self-contained and able to survive. "Our concept of the individual is totally warped," she says. "All of us are walking communities of microbes. Plants are sedentary communities. Every plant and animal on Earth today is a symbiont, living in close contact with others."

Consider one species of desert termite. Living in its hindgut are millions of single-celled, lemon-shaped organisms called *Trichonympha ampla* (p. 78). Attached to the surface of one *T. ampla* live thousands of whiplike bacteria known as spirochetes. Inside live still other kinds of bacteria. If not for these microbial symbionts (in some wood-eating insects, the symbionts are too numerous to count), the termite, unable to digest wood, would starve.

But, the termite itself is only one element in a planetary set of interlocking, mutual interactions—which Lovelock's neighbor, novelist William Golding, dubbed Gaia, for the Greek goddess of the Earth. After digesting wood, the termite expels the gas methane into the air. (In fact, the world's species of termites, cows, elephants and other animals harboring methane-producing bacteria account for a significant portion of Earth's atmospheric methane.) Methane performs the vital task of regulating the amount of oxygen in Earth's atmosphere. If there were too much oxygen, fires would burn continuously; too little, and animals, plants and many other live beings would suffocate. Earth's atmospheric oxygen is maintained, altered and regulated by the breathing activities of living creatures, such as those of the methane-makers in the microcosmos. Life does not passively "adapt." Rather, it actively, though "unknowingly," modifies its own environment.

When NASA sponsored a search for life on Mars, in the early 1970s, Lovelock looked for ways that life might have modified the Martian atmosphere. Finding no particular modification attributable to microbes or any other form of life, he and Margulis predicted that

Freelancer Jeanne McDermott lives in Cambridge, Massachusetts. She authored The Killing Winds: The Menace of Biological Warfare *(Arbor House, 1987).*

the Viking probe would find a dead Mars. They turned out to be right. "Gaia is more a point of view than a theory," says Margulis. "It is a manifestation of the organization of the planet."

That organization resembles those hollow Russian dolls that nest one inside another. "For example, some bacteria in the hindgut of a termite cannot survive outside that microbial community," explains Gail Fleischaker, Boston University philosopher of science and a former graduate student of Margulis'. "The community of termites, in turn, requires a larger ecological nest. And so it expands. You will never find life in isolation. Life, if it exists at all, is globe covering."

Although Margulis provided the "biological ammunition" for Gaia and remains its staunch advocate, she does little work on it directly. "I've concentrated all my life on the cell," she says. The ideas that she has championed were once "too fantastic for mention in polite biological society," as one scientific observer described them in the 1920s. As recently as 20 years ago, these ideas were so much at odds with the established point of view that, according to another observer, they "could not be discussed at respectable scientific meetings." Although aspects of the symbiotic theory of cell evolution still provoke hostility, the theory is now taught to high school students. "This quiet revolution in microbiological thought is primarily due to the insight and enthusiasm of Lynn Margulis," states Yale ecologist G. Evelyn Hutchinson. "Hers is one of the most constructively speculative minds, immensely learned, highly imaginative and occasionally a little naughty."

Wary of dogma, Margulis encourages students Polly Cherau (left) and Tom Lang to follow their own ideas.

Kith and kin in lab and home

There is little separation between Margulis' professional and personal lives. You're just as likely to find her children in the lab as at her home. She drops her grandson Tonio at preschool on the way to hear a student defend his thesis. There are times when you wonder if she runs a family business. Dorion Sagan, her eldest son from her first marriage, coauthored the popular book *Microcosmos* along with five other scientific books. Her daughter-in-law Christie Lyons has illustrated most of them. Students say that they are treated like extended family; she shares the benefits of her prestige, insisting, as other scientists of her stature rarely do, that they are invited as well when she speaks at exclusive scientific meetings. "That's the way it should be," says Lovelock. "That's something consonant with the theories we've worked on. We're ecumenical people."

Unlike most authorities on microbes, Margulis has never taken a microbiology course. She was born in 1938 and grew up in Chicago, the eldest of four sisters. Intellectually precocious, she started the University of Chicago's undergraduate program at 14. It was the Great Books era at Chicago. Chancellor Robert Hutchins had instituted a curriculum in which students read original works, following the development of ideas rather than academic disciplines, an intellectual approach that Margulis embraces to this day. In her second year, she took a natural science course that examined the question: What is heredity? Watson and Crick had just discovered DNA, and she became fascinated. She also met a fellow student whom she later married, astronomer Carl Sagan.

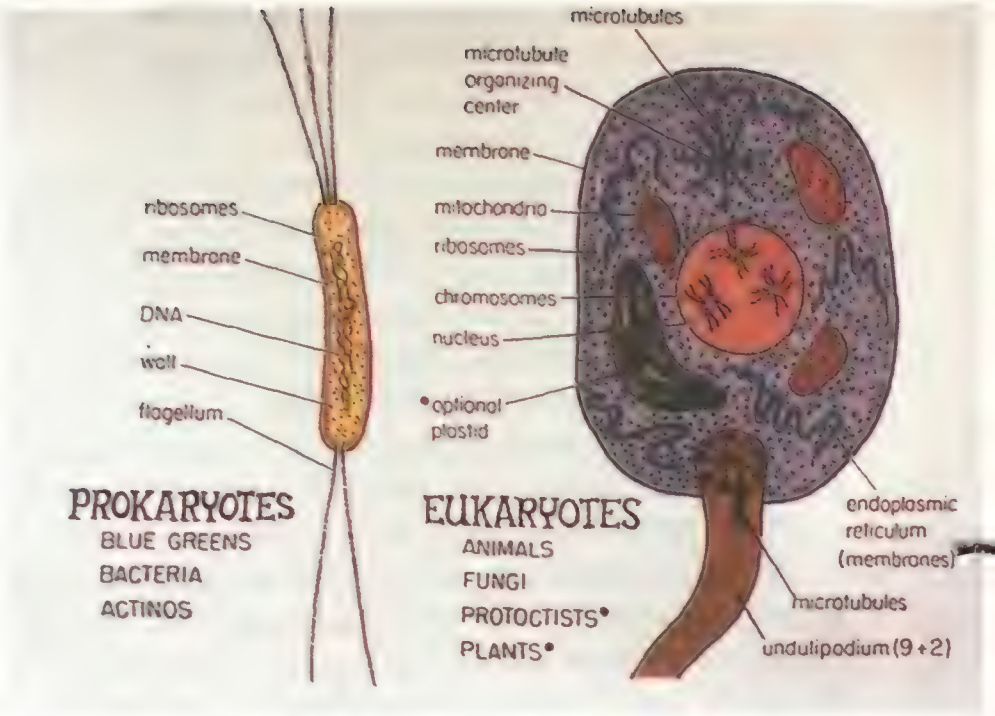
Dorion Sagan laughingly refers to his parents as his Earth mother and Space father. Indeed, while Carl Sagan emphasizes the cosmos of the stars, Margulis stresses the microcosmos on Earth. Where Sagan speculates about extraterrestrial life, Margulis insists that life be seen as a planetary phenomenon whose Earth-bound limits remain unexplored.

After graduation, Margulis and Sagan moved to Madison where she pursued a master's degree in zoology and genetics at the University of Wisconsin. There she studied with cell biologist Hans Ris. They discussed puzzling patterns of heredity that could not be explained by the conventional assumption that the genes in the cell's nucleus solely determined the genetic make-up of its offspring. In 1960, Margulis followed Sagan to Berkeley. For her dissertation she wanted to look for genes in the cell's cytoplasm, the area outside the nucleus; her professors tried to talk her out of it.

By 1963, Ris and W. S. Plaut—another of Margulis' professors at Wisconsin—published a photograph showing that DNA resided in the cytoplasm, specifi-

cally in the chloroplasts, tiny organelles found in plant cells. (Organelles are the visible bodies and structures inside a cell.) The presence of DNA outside the nucleus baffled the biological community. (Boris Ephrussi, a Russian geneticist working in France, made the joke that there were two kinds of genetics—nuclear and unclear.) But not Margulis. "In Ris' classes, I had read the cell biology and genetics literature of the late 19th and early 20th centuries." She remembered the "crackpot" idea that the genes in the cytoplasm and the genes in the nucleus had different origins in evolution.

The first creatures to evolve happened to be the last creatures that scientists discovered. It wasn't until the advent of good microscopes in the 19th century that the scientific community began to appreciate the diversity of the microbial world. No one knew how to classify microbes. Zoologists called the moving little things animals. Botanists called the green little things plants. But neither classification made sense. It turns



Symbiotic theory of cell evolution holds that plastids, other eukaryote organelles used to be prokaryotes.

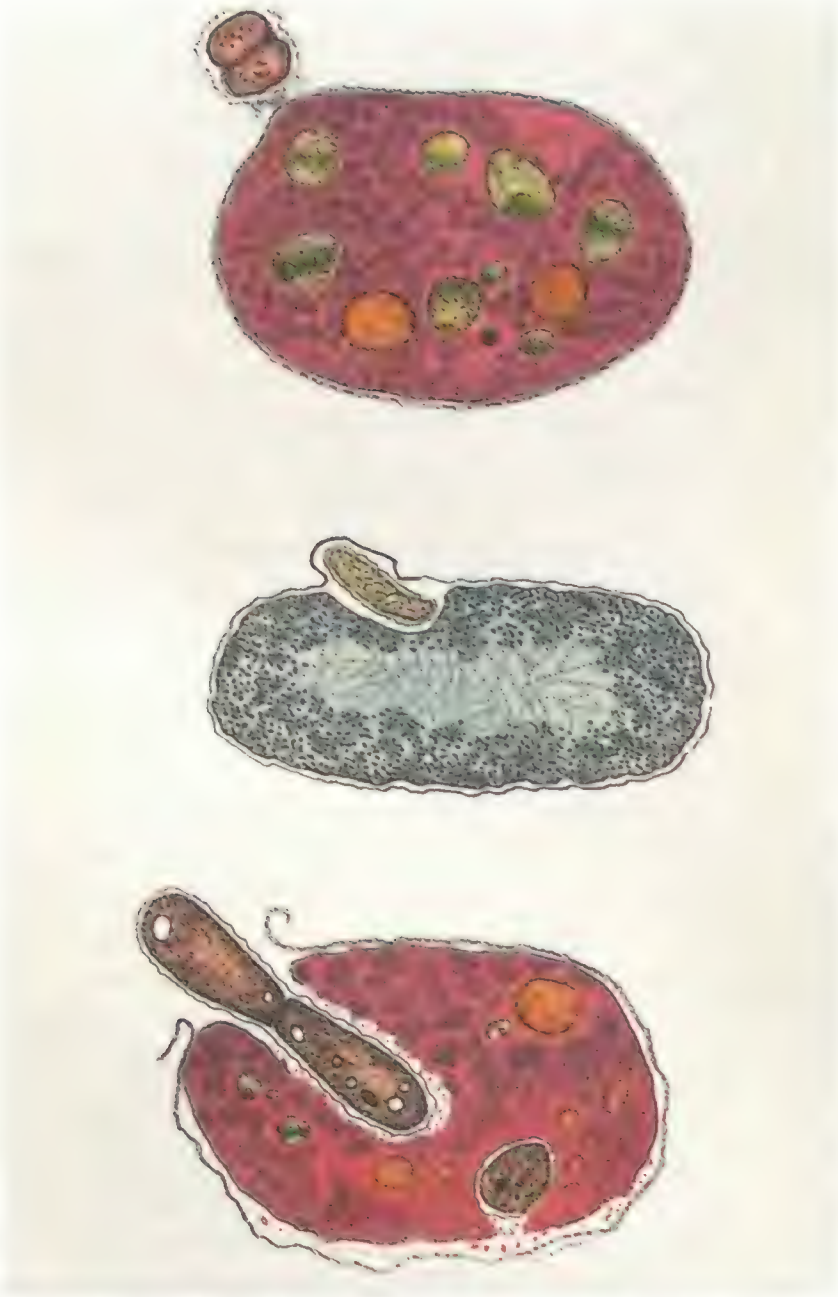


Plate from *The Microcosmos Coloring Book* shows three ways in which small bacteria prey on larger cells.

out that the most profound difference between living creatures lies not in their color or their locomotion but in the cells of which they are made.

There are only two types of cells on Earth. One type has a nucleus. The other type does not. Animals and plants are made of nucleated cells. Most microbes are made of nonnucleated cells. At the turn of the century, Russian biologist K. S. Mereschkovsky proposed the idea that plant and animal cells evolved from symbioses between bacterial cells. He based his theory on the similar appearances and behaviors of free-living bacteria and the organelles of plant and animal cells—their chloroplasts and nuclei. Margulis saw that the advances in electron microscopy and molecular biology vastly expanded the quality and quantity of evidence.

The years from 1963 to 1967 were not easy. Margulis got her PhD at 26 and moved to Boston; she and Sagan ended their marriage. Without a formal academic position, she continued to build a case for the symbiotic theory. A big break came when she saw a list, drawn up by British crystallographer J. D. Bernal, of the most important unresolved biological questions of the times. One was the origin of the nucleated, or eukaryotic, cell. She immediately sent Bernal a three-page reply and, having mimeographed it, mailed copies to scientists interested in cell evolution. Her solution was the theory that cells with nuclei evolved from the merger of two or more different bacterial cells lacking nuclei. The responses to her letter resembled a Rorschach test. One scientist corrected her grammar. Another ordered her out of his field. "Bernal said I'd solved the problem," she says.

By 1970, she was an associate professor at Boston

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The symbiotic community of microorganisms in desert termite's hindgut is what enables it to digest wood.

University and was married to Thomas N. Margulis; she was the mother of two more children and author of the first comprehensive account of her ideas, *The Origin of Eukaryotic Cells.* One reviewer wrote, "Readers will find this book sprawling, stimulating, irritating and challenging but they will have difficulty ignoring it." Another wrote that "it had to be a young scientist and a woman who dared to challenge the scientific establishment."

As one former student puts it, the scientific community tried to shut her up by attempting to prove her wrong and by denying her grant support. Ironically, she turned out to be right, no doubt a factor in some of the controversy she generates. "She's made people think more than any other figure in contemporary biology, and for many men it is particularly galling that this has been done by a woman," says Culberson. By 1981, when Margulis published *Symbiosis in Cell Evolution,* a new version of the thesis of her first book, the scientific establishment had finally accepted the notion that mitochondria and chloroplasts evolved symbiotically. "I always thought that everyone would catch up," Margulis says wryly.

With acceptance came "semifame," according to Betsey Dyer, a former graduate student of Margulis' and now professor of biology at Wheaton College in Norton, Massachusetts. Grant money that had been impossible to obtain came in with more ease. Margulis could no longer answer her own phone. The lab tripled in size. Then, in 1983, she received the honor that is second only to the Nobel for an American scientist: she was elected to the National Academy of Sciences. "They called out of the blue. I was totally shocked. Amazed," she says. The certificate hangs on her office wall, along with pictures of the children and one taken of her scavenging mudflats in Baja California for spirochetes.

The case of the fast-evolving amoebas

The symbiotic scenario that Margulis has constructed for the evolution of the first nucleated cell is finally being discussed in polite biological society. It is, and always will be, a rough scenario because no fossils and no witnesses remain. But Margulis constructs it from an impressive understanding not only of geology, genetics, molecular biology and natural history but of the microbes that flourish today. She tells the story of Prof. Kwang Jeon at the University of Tennessee at Knoxville, who noticed that the amoebas used in his research looked sick. Under the microscope, he saw that perhaps 100,000 rod-shaped bacteria infected each amoeba. Only a few infected amoebas survived; of these, Jeon selected the strongest and nurtured them. Five years later, not only had the amoebas recovered, but they required the bacterial infection in order to grow at all. If such a symbiosis evolved in five years, it is easy to imagine how nucleated cells evolved in more than a billion. Margulis' scenario has clarified a new taxonomy of living things, expanding the traditional division of plants and animals into five kingdoms (p. 72), each based on fundamental cell structure.

The first cells with mitochondria, the organelles that produce energy for the cell, probably appeared by 1.4 billion years ago when large quantities of oxygen first entered Earth's atmosphere. Oxygen-breathing bacteria (perhaps akin to the modern-day *Bdellovibrio* or *Daptobacter*) invaded bacteria that did not breathe oxygen. Most killed their prey, but in a handful of cases the prey resisted and worked out an uneasy truce. The prey gave the invader a continuous source of food while the invader gave the prey the means to survive in an oxygen-rich environment. What began as a hostile takeover ended as a merger—and the emergence of nucleated cells, eukaryotes.

The first cells with chloroplasts, the organelles that convert sunlight into energy, probably evolved later. This symbiosis began not as an invasion but as a meal. The host eukaryotes swallowed photosynthesizing, free-oxygen-producing bacteria (probably akin

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to *Prochloron*), but in a handful of cases the ingested bacteria resisted digestion. The new chimera managed to survive where neither could have on its own.

As might be expected from someone who thrives on combating the status quo, Margulis has not been content to rest on her laurels. She is avidly gathering evidence to prove the last and by far the most controversial, most heretical chapter of the symbiotic theory. "We believe that the nucleated cell's internal transportation system, its ability to move within, is the contribution of another symbiotic merger with bacteria, this time with rapid whiplashing spirochetes," she writes.

Spirochetes are tiny, spiral-shaped, highly mobile bacteria, of which the most notorious is the one that causes syphilis. In mudflats along the coast of Baja California where conditions bear a resemblance to those found on Earth three billion years ago, Margulis discovered a spirochete that, she believes, is like the ancestors of the "tail"-bearing cells in the human body, such as the sperm cells and those that line the lungs or oviduct. She also believes that related spirochetes were the ancestors of an entire intracellular transportation network, constructed of microtubules, which includes the tails and the mitotic apparatus responsible for chromosome movement in cell division.

This chapter in the symbiotic theory is considerably harder to prove. Unlike the ancestors of the mitochondria and the chloroplasts, early spirochetes left almost no tangible clues behind. Only in the past year has some tantalizing new evidence emerged. "The most important discovery of the century in cell biology is the finding made by David Luck and his colleague John Hall, at Rockefeller University, of kinetosomal DNA," says Margulis. She believes that DNA in the kinetosome, the structure from which sperm and all other cell tails grow, had at one time belonged to free-living spirochetes.

"Most people in microbiology know this hypothesis but can't take it seriously. There's no reasonable body of evidence. My attitude is wait and see, and I'm more sympathetic than many," says Peter Greenberg, microbiologist at the University of Iowa. Supporters say it misses the point to argue that Margulis may be wrong. They cite this work as an example of her excellence as a theoretician who pushes the frontiers of current thinking with provocative, testable hypotheses. Other scientists scoff. At a conference several years ago, a former Margulis student, University of North Texas biologist Stephen Fracek, caught "a lot of flak" when he presented some preliminary data. At a postconference party, one of the staunchest critics said that he could never support the theory, even if Margulis demonstrated amino acid homologies. "There is enormous hostility to the ideas behind the data," Margulis readily acknowledges. "Some people resist the concept that the tails of their own sperm evolved from free-living spirochetes."

Margulis, who believes "absolutely" that the case for spirochete ancestry will be proved, says that it will "change everything. Neurobiology, for example." Then she speculates, "You can reduce the study of the nervous system to physics and chemistry, but you're missing the microbiological step. It's as if you documented the changing surface of Earth at urban sites, using Landsat images, without knowing anything about people. In the nerve cell, the axons and the dendrites that make the physical connections that allow us to communicate are latter-day spirochetes. Nerve cells, having long ago discarded the rest of the spirochete body, use the fundamental motility system of spirochetes. Think of the nerve as coming from what had formerly been a bacterium, 'trying' but unable to rotate and swim. Thought involves motility and communication, the connection between remnant spirochetes. All I ask is that we compare human consciousness with spirochete ecology."

"History may prove she isn't always right," says G. Evelyn Hutchinson. "She often puts things in a dramatic way." But Margulis cares little for always being right. She cares about stripping the rungs off the evolutionary ladder, puncturing the anthropocentric view of life and encouraging her students to ask embarrassing questions. Her latest projects (coauthored with Dorion), aimed at the next generation of scientists, expose young minds to the biological riches of unseen worlds. They are called *The Garden of Microbial Delights* and *The Microcosmos Coloring Book.*

Always on the move, Margulis pedals to her lab early, gets most of her work done before students arrive.

By Richard Conniff

Coasters used to be scary, now they're downright weird

After hitting the skids several decades ago, roller coasters are on the rise again, featuring loop-the-loops and twists never seen before

Riders on the Vortex, a 1987 steel coaster at an Ohio amusement park, prepare to be inverted six times.

It's a damp, chilly evening in April, the cruelest month, when roller coasters begin to stir and tortured screams fill the night air all across North America. In the fluorescent glow of an amusement park arcade booth, a short walk from a soul-jarring coaster designated the Beast, a cluster of teenagers engage in time-honored dialogue:

"C'm'on, Bill, ride," they urge.

"I don't wanna ride," says Bill.

"You chicken?"

"No, I'm not chicken." He steps closer and confides, "The last time I rode I got to sit next to a really cute chick and I puked."

A girl in the group rolls her eyes and walks away. "I'm sorry," says Bill, "I didn't mean to offend you." But his male friends blunder on: "OK, OK, we'll sit you next to an ugly girl this time."

"Yeah," one boy reasons. "And if you get sick, maybe she'll like you."

Don't listen, Bill. Just walk away. Dump these callow friends and go after that nice girl, the one who—ah, jeez—the one who's already standing in line for the Beast, and whose dance card for the evening doubtless also includes a fling with King Cobra, the Vortex and the Racer, roller coasters that will, respectively, fire her through a vertical loop in a standing position, flip her upside down at high speed six times, and loft her from her seat with that ineffable force known among enthusiasts as "negative Gs." What you're up against here, Bill, I'm sorry to report, is a thriving roller coaster revival in which nice girls, and also their grandmothers, are lining up with their boyfriends to ride increasingly bizarre creations of steel and wood, each calculated to be taller, faster, steeper and, above all, scarier than anything ever attempted before.

For the first time since the 1920s, the number of big coasters in this country is on the rise, from 147 in 1979 to 164 today, and you don't even want to know what you're missing. Just this season, about a dozen new or relocated roller coasters have opened around the conti-

nent. Some of the new looping coasters look as if the doodlings of a penmanship student have somehow materialized in tubular steel across the skyline. (Imagine suddenly shrinking, like Alice, and spinning down into one's doodles at about the speed of light.) Other coasters, like the King Cobra at Kings Island outside Cincinnati, let you ride standing up, in a cushioned steel harness. When I looked up during a recent visit there and saw a trainload of people doing the loop-the-loop in this fashion—their faces radiant with fear and excitement, their arms raised up as if in prayerful pleading for more sensation—I thought for a moment that I'd stumbled into a religious-articles factory and was looking at rows of ecstatic martyrs hurtling down a deranged assembly line.

Let me tell you what you are missing, as one who, before a malicious editor asked me to write this story, had ridden a roller coaster only once, and then by mistake. (It was at Disney World and I was misled by the short line and the sturdy, geological sound of an enclosed ride called Space Mountain.) For my first *willing* ride I chose the Beast at Kings Island because it was an old-fashioned wooden coaster, the sort of cozy ride on which you remain right side up and seated, and because the Beast's tenth anniversary, last April, seemed like a suitable occasion. A park official commemorated the opening with the sort of overwrought hyperbole that coaster marketing people love: "On Friday the 13th, which was appropriate, in a drizzle, which was appropriate, a legend was born. It came out screaming, 7,400 feet long." Then we took our seats and the lap bars came down.

Something awful will happen

The essential elements of any roller coaster design are thrills, of course, but also a kind of narrative tension and unpredictability. "It should have the pacing of a good movie," said Randy Geisler, a balding Social Security bureaucrat who was riding the Beast in his private capacity as president of the American Coaster Enthusiasts, or ACE, a kind of fan club. What was his idea of a good movie? "*Invaders from Mars*," he said, his eyes widening behind his wire-rimmed glasses, "you bet."

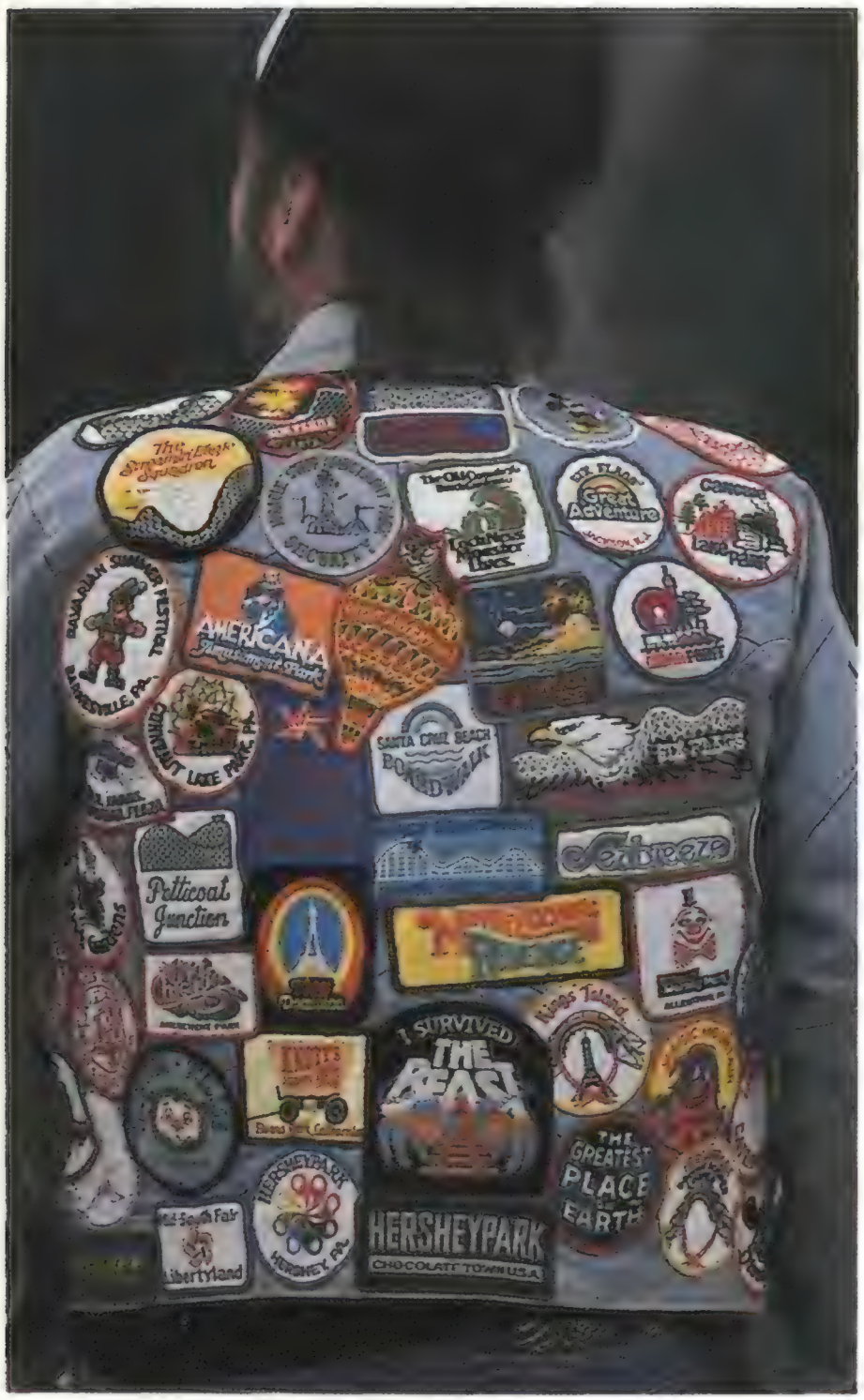
Pacing is one reason the clanking, ratchety trip to the top of the lift, when the train is being dragged up by a chain underneath the axles, takes so long—to draw out the deepening sensation that something awful is about to happen. On the Beast unpredictability is total because the ride uses the contours of a hilly wooded area to conceal everything that follows. The rider looks out from the lift at the squirrels and the trees, and thinks how lovely it is to have lived long enough to see the first green-gold buds of spring. And then the train goes over the top.

Passengers hold hands high as the Beast, 1979 wooden coaster at the same park, nears 60 mph on first drop.

Photographs by Chad Slattery

The coaster's thrilling comeback

ACE's president, Randy Geisler (right), and editor Paul Ruben have been riding and rating coasters for years.



A member of the American Coaster Enthusiasts (ACE) displays badges of honor earned all over the country.

Riders on Magnum XL-200 (opposite), which debuted this spring, complete the last leg of a harrowing trip.

By current standards, the Beast's first drop is modest. In May, a new steel coaster called the Magnum XL-200 opened at Cedar Point in Sandusky, Ohio, with a 60-degree first drop from about the height of a 20-story building. I'd heard some ACE members swapping fantasies about it that morning: "It's like driving your car with your head out the window at 70 miles per hour," said Paul Ruben, a cherubic, middle-aged gentleman from Rochester, New York. "But to get the full effect, you have to drive it off a cliff." "And you can do it over and over," another enthusiast exulted.

By contrast, the Beast drops at a mere 45-degree angle, 135 feet straight down into an impossibly small tunnel, and I have never been so scared in my life. We were already starting to hurtle down when I summoned the courage to open my eyes and look at how I would be spending the next 3 minutes and 40 seconds. A sharp, wincing intake of breath (expletive deleted) and the feeling of innards popping up like a parachute in one's rib cage. My hair flew back, and my eyes peeled wide and filled with tears, a product of the 60-mph wind and also of self-pity. My teeth clenched and my knuckles locked bone-white around the lap bar. The train plunged into a short hell-rattling tun-

nel, whipped around a sharp turn in the dark and roared up another big hill. Scenery stuttered by like a film getting snagged in the gate of the projector. Everything veered out of control and it was clear that I was about to die.

Then the train slowed down—a chance to reflect on one's good fortune in not being seated next to a really cute chick, and to imagine that it was over and one had lived through it after all. "Here's where it starts to get good!" an ACE member yelled, turning around in the seat just ahead of me. Fine, I thought. At least he would die first. This time the drop was a mere 18 degrees, but stretched out over a long, curving length of track, to make the torture of acceleration more exquisite. At nearly 65 mph, the train shot into a tunnel and spun 540 degrees around a banked helix, slowed down only by the screaming of one rider, who felt like a bug being sucked down a bathtub drain. At the bottom, heading back into the station, I checked for my pulse but I'd lost it somewhere back on the tracks.

Richard Conniff took ten rides while reporting this story, including four on the Beast. He says this has made him a hero to his children.

The natural question that arises in any normal mind during those shattered moments before exiting a roller coaster is why anybody would have invented such a device, and the short answer is that the Russians did it. They built ice slides as early as the 15th century in St. Petersburg. Gravity-powered rides, sometimes known as Russian Mountains, evolved in Europe and then in the United States. The first roller coaster at Coney Island was constructed in 1884 by LaMarcus Thompson, called with characteristic amusement park understatement the "father of gravity." Coasters took off in this country to such an extent that they are now known in the Soviet Union as American Mountains. By one estimate, the United States had at least 1,500 of them before the coaster's demise during the Depression.

The other immediate question is why the roller coaster would ever have come back, especially at a time when risk-averse insurers look sideways even at tame stuff like seesaws. Here is one partial explanation for the revival: when my first ride was over and I had taken the time to straighten my hair and reconstruct my dignity, I hesitated—and then got back in line and rode the Beast again.

In case you had any doubts, most of the country's

amusement parks know what they are up to. The ones that don't, quickly go bust because they cannot cram enough business into a typical five-month season to support the large workforce a park requires and the enormous capital cost of the rides. Because those costs stay about the same whether 20,000 people or 50,000 come through the turnstiles in a day, parks depend heavily on marketing and repeat business, particularly among the 18- to 24-year-old set. Exit polls show that what brings 'em back are thrill rides, and no thrill ride is more marketable than a new roller coaster. It's like a baseball team signing a power hitter: Cedar Point has attracted three million people per season just four times in the past 19 years—three of them after opening a new coaster.

What's better than a power hitter is a power hitter with a reputation for something extra, like clutch hitting or an October hot streak. For roller coasters, the equivalent in drawing power is a new technology—like the corkscrew, the vertical loop, and in recent years the stand-up coaster—or some record-breaking superlative. Marketing considerations thus determine not just whether a coaster gets built, but what it will look like and how it works—for instance, whether it turns you upside down six times or seven. Partly because of ACE, which has 2,128 members around the country, all of them busily scouting coasters and spreading news, non-ACE amusement park customers tend to know about bigger or better things being done in Florida or Tokyo. Even though these distant parks aren't direct competitors, a top amusement park has to keep up with them, or better yet, stay ahead, if it wants to convince the local crowd that they're getting something special for the $15-20 admission charge.

The first Coney Island coaster, c. 1884, treated riders to a one-minute thrill for only a nickel.

The coaster revival thus sometimes seems like a coaster war. When I rode the Beast in April, for instance, it was the world's longest, tallest, fastest wooden coaster. A month later another wooden coaster, the Hercules, by the same builder, Charles Dinn, opened at Dorney Park in Allentown, Pennsylvania, and stripped away all but the first of those superlatives. Last year, Six Flags Great America outside Chicago built the world's tallest, fastest coaster, period, called Shock Wave. This year, Six Flags Great Adventure in New Jersey built an almost identical coaster, but made it three feet taller. Called the Great American Scream Machine, it ranked briefly as the world's tallest and fastest, but the marketing people carefully positioned it merely as the tallest, fastest *looping* coaster. Three weeks later, Cedar Point's Magnum XL-200 opened with no loops but a 201-foot first hill—a statistical leap that Richard L. Kinzel, the park's president, modestly hopes will keep the $8 million coaster on top for "a couple of years."

Rougher than a ride in space

Whether or not a coaster has all the right superlatives, hyperbole also seems to be essential to success. Thus the Great American Scream Machine awarded a "red badge of courage" to its first riders, including a delegation from ACE, and Cedar Point distributed a scale drawing in which the height of the space shuttle *Discovery* did not measure up to the first hill on the Magnum XL-200. Disney World had a similar idea in the mid-'70s when it got astronaut James Irwin to describe its Space Mountain as "rougher than Saturn V."

Coaster enthusiasts stoke up their appetites with this sort of thing, and worse. ACE members tend to like their rides rough, and they mostly prefer wooden coasters, which have fewer passenger restraints because they don't go upside down. At one point, I heard an ACE member inquire with breathless anticipation if it was true that on its test run a new wooden coaster had hurled the sandbag dummies out of the car. Because

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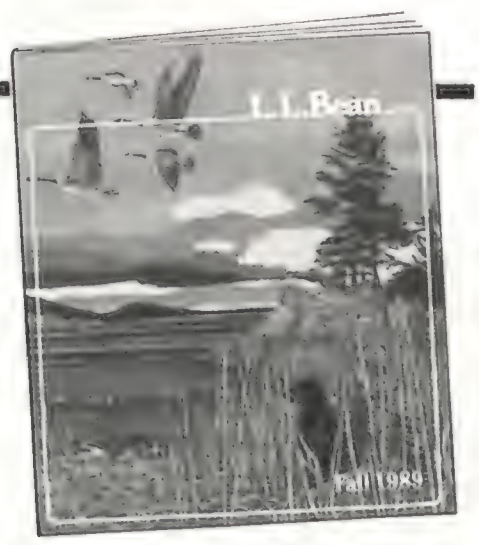

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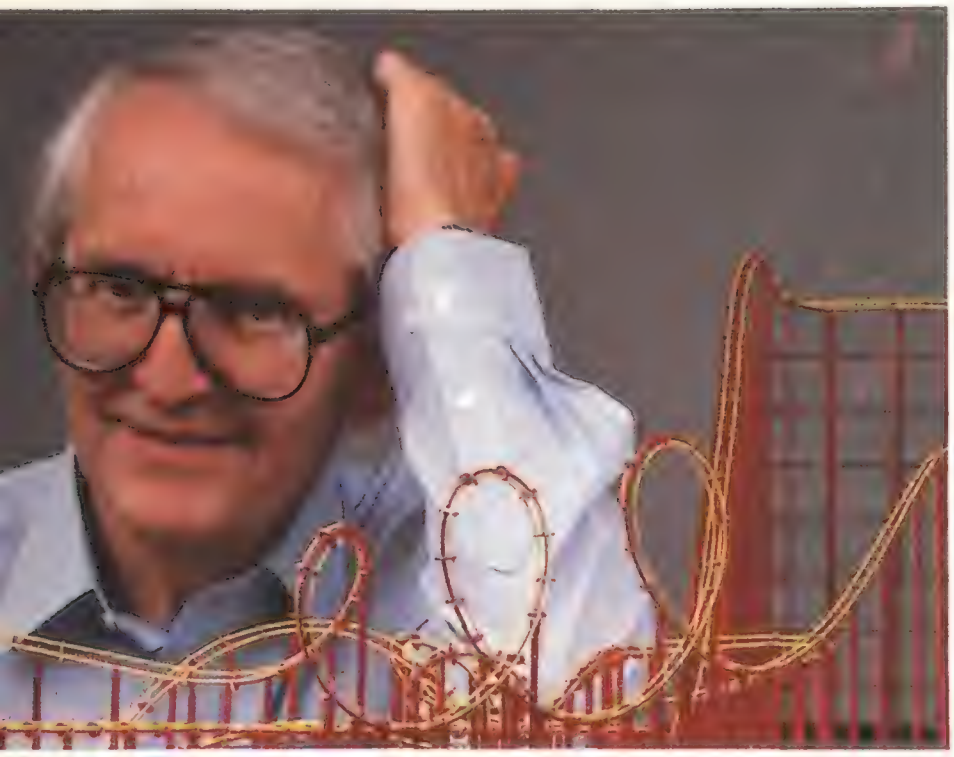

In his Utah office, Ron Toomer, a leading designer of new-wave steel coasters, shows a model of one ride.

The Corkscrew, triple-looping coaster designed by Toomer, flips upside down over midway at Ohio park.

this kind of hell-bent enthusiasm provides good fodder for television camera crews, amusement parks often include an ACE preview in the promotional hoopla for a new coaster. Robert Cartmell, an art professor and roller coaster historian (SMITHSONIAN, August 1977), recalls one park that flew him out for an opening and provided a limo from the airport. Unhappily the coaster turned out to be a good family ride, the ultimate ACE pejorative. Cartmell said so, and had to find himself a taxi back.

The competition for bigger thrills

But if the design is right, and the aura of fear and anticipation has been carefully nurtured, a coaster like the Scream Machine will pay back its $6.8 million cost in increased attendance during the first year or, at worst, the second, according to Ray Williams, president of Great Adventure. (He considers it good business to keep up his membership in ACE.) The quick payback is essential, Williams says, to provide capital for next year's new thrill ride. "There's no telling where they'll stop," he adds. "But someone will do something bigger and better and, to be honest, so will we."

The insurance companies have tagged along because of the dark secret of the roller coaster world: statistically speaking, roller coasters are safer than merry-go-rounds. People seldom try to get off a coaster in midride, and, even when this bright idea occurs, the passenger-restraint system usually prevents them. Many coasters use computerized braking systems and are divided into sections to keep trains safely separated. They also rely on wheels inside, as well as above and below, the rails to keep cars from flying off into space. Insurers require effective training of operators in loading and unloading procedures. Most parks also follow a daily schedule for equipment maintenance and hire a consultant to do an annual inspection, including x-ray and other testing of structural elements and car parts.

"When you do have an accident," says an insurer who specializes in amusement parks, "man, it's usually a lulu." Between 1973 and 1988, twenty-seven people died on roller coasters in North America, some of them because they stood up in midride, others because of operator error or equipment failure. But Richard Coulter, a consultant who inspects coasters, likens their safety record to that of the airlines. Fatalities stick in the mind because they are so spectacular, but they are rare relative to the number of coaster rides per year, estimated at 214 million. Coulter says that if a coaster's paint is peeling and its operators look sloppy, go elsewhere. A good rule. On the other hand, the Mindbender in Edmonton, Canada, was less than a year old in 1986 when it flew off the tracks, throwing three riders to their deaths.

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The coaster's thrilling comeback

The Beast plunges down its first hill. Although it's a "woodie," the modern layout conforms to the terrain.

William Cobb, a restorer of wooden rides, pokes fun at his own reputation as a devilishly clever designer.

All statistics and precautions to the contrary, the catastrophic possibilities run through every rider's mind: We're going too fast. . . We're not gonna make the next curve. . . *This ride is it.* And those thoughts are part of the peculiar psychology of the roller coaster. In his book *The Incredible Scream Machine,* Robert Cartmell reports that news of accidents on a coaster called the Russian Mountains in Paris in 1804 had the effect of increasing the ride's popularity.

In search of LaMarcus Thompson's modern-day counterparts, I traveled first to a squat brick building in Dallas, the office of William Cobb, who is revered by many ACE members as the leading designer and restorer of traditional wooden coasters. Cobb is a short, soft-spoken, 71-year-old with black-rimmed eyeglasses and a mess of red pencils in the pocket of his short-sleeved shirt. As we talked, his longtime secretary, Margaret Rowe, put on a videotape that showed riders screaming distraught testimonials to the effectiveness of his work.

"You have to be a little bit mean," Cobb said, smiling gently and looking too small for the desk chair in which he swiveled from side to side. He sipped at a Dr Pepper, and proceeded to speak in a blend of evil genius and scientific exactitude. If a listener wasn't always sure which aspect of Cobb's personality was in command, that was exactly the calculated illusion a good coaster should give. "Sometimes you have to be a little bit sneaky," he continued. "You get them going on a nice straight track and they think 'This looks smooth,' and then you dip it down a little to give 'em a good jolt. Or you have it so that when they go over the hill it looks like they're going to get their heads chopped off at the bottom."

"They'll duck every time," said Rowe.

"Actually they'll have a nine-foot clearance everywhere," said Cobb. "Absolute minimum. You figure out where the tallest man could stand and reach out and hit something, 'cause they'll try. We don't guess at anything. What we do is actually kind of by the book. We like to think this is a precision piece of equipment."

One of Cobb's coasters, the Riverside Cyclone in Agawam, Massachusetts, came up on the videotape and he watched himself describing it as "the most vicious Cyclone ever." He nodded contentedly. "I just woke up with indigestion and dreamed that one up," he remarked. Putting his dyspeptic imaginings on paper may require 2,000 pages of blueprints for a single coaster. "We calculate at each point what the velocity is, so we know what the action of the car will be, how much it needs to be banked, what the force down is, or if there's any uplift or side force."

"He'll say, 'Let's put a hoopty-do in here,' " Rowe interjected, plainly uninterested in physics.

Cobb smiled and explained that a hoopty-do was a sharp bank left followed immediately by a sharp bank right. Much of the physics and also the artistry of a coaster design is in the banking: if the track doesn't bank enough on a turn, riders get sore shoulders from whacking into the sides of the car. "If you make it too smooth," Cobb explained, "it'll be like sitting in your living room."

"It's where you put your rock'n'roll into the roller coaster," added Rowe.

The other great name in coaster design is Ron Toomer, a mild tinker-and-putter sort who grows or-

chids in his spare time and is prone to motion sickness. When I visited him in Clearfield, Utah, where he is president of Arrow Dynamics, his staff rolled a videotape. A train was just plunging down the first hill on Shock Wave, which Toomer designed. "Oh, man, that'd be horrible there," he remarked.

Despite his squeamishness, Toomer is the chief arms supplier of the coaster wars. He was the first designer to take a coaster upside down, with the Corkscrew, and he has been the leader in pushing the looping coaster to its present limits. (A German competitor, Anton Schwartzkopf, generally gets credit for perfecting the first successful vertical loop, using a teardrop shape called a clothoid loop to slow the train down on the ascent and speed it up through the inversion. But Schwartzkopf's company went bankrupt after the Mindbender tragedy.) At 59, Toomer remains the leading designer of steel coasters, including this year's Scream Machine and Magnum XL-200. "We build the biggest one in the world just about every year," he said, more with bemusement than boastfulness.

The coasters his clients demand must meet a long list of criteria. "The thrill is in the top ten," said one of Toomer's engineers, Herb Mudrow. "But just barely." A coaster must be safe, above all. It must look spectacular enough to draw people off the highways and into the park. It has to give a good enough ride to make waiting in line for hours seem worthwhile. Because more rides translate into greater customer satisfaction, it also has to flush riders through fast enough to get capacity up around 1,600 passengers an hour. It needs to be situated so that customers on the midway can stand and just watch, which is thrilling enough for many people and also helps keep down the lines. It cannot, however, be close enough for some damned fool to throw a sweater into the machinery (it's happened). It has to have lots of different elements—loops, boomerangs, corkscrews—and they have to be properly spaced, with enough breathing room in between for riders to realize what they've been through, but not enough for them to get ready for what's coming next. It rarely puts more than 3.5 times the force of gravity on a passenger, even in the "pullout" on a hill, but it needs to have some claim to fame, to push the limits, to try things no one ever dreamed of before.

Coasters can do 'snap rolls,' too

Toomer led the way into his vast warehouse of coaster parts to show me a scaled-down, 350-foot-long prototype of what's going to happen next. "We call it the Pipeline Coaster," he said, standing in the middle like a kid with an outsize model railroad. Overhead was a low-slung rocketlike train with wheels at the sides, not underneath. Instead of rolling on top of the tubular steel tracks, it rode between them, in a sort of pipeline. "It's kind of like an airplane," said Toomer. "Airplanes do these things called snap rolls."

Somebody plugged the thing in and Toomer pushed the start button. The train made the usual agonizing climb. Then, going off the top of the lift, it suddenly flipped upside down and went into an inverted plunge down the first hill. At the pullout, it. . . But, honestly, you don't want to know.

By now, it made a kind of sense to me that amusement parks would be clamoring to build rides like this one, and that insurers would be willing to cover them. The continuing mystery was why people (not including Toomer or Cobb, both of whom plead infirmity) would want to ride them. And not just ride them, but in the case of some ACE members, build their lives around them. At the Kings Island opening, for instance, was a computer operator for the Internal Revenue Service who had ridden the Beast 4,357 times and spent an estimated three months just waiting in line. Another ACE member, a store manager, said he had ridden the Racer 8,043 times (and if you're still out there, Bill, the reassuring news is that he didn't throw up until ride number 7,211). There was a 34-year-old man who had left his loving Sicilian mother in Boston in order to buy a house near Kings Island, from which, on summer evenings, he can hear the sweet tunnel-roaring of the Beast.

These were, of course, the extremes. A group of

King Cobra, world's first stand-up looping coaster, whisks rigid passengers through 360-degree maneuver.

old high school pals from Chicago, wearing running shoes and neck loops on their eyeglasses, were probably more typical. They told me that they get away from their families for a coaster jaunt only once or twice a year now. "There are fanatics and then there are *fanatics*," one of them explained. "I think we're in the former category."

I asked Randy Geisler, the aficionado of *Invaders from Mars*, to explain what makes people tick in this rather loosely defined but more approachable category. "Psychological analysis has been done," he said, a little uneasily. "We're afraid it will reveal we all hate our mothers and secretly want to wear leopardskin underwear."

This sounded plausible, so I phoned a University of Wisconsin psychologist named Frank Farley, who is the leading researcher on the thrill-seeking, or "Big-T," personality. In Farley's theoretical view, some people are "Little-t" personalities and tend to be overarousable. With a little stimulation, the pulse races and they break into a sweat; neuronal impulses go jitter-jogging across their brains. Big-T personalities, by contrast, tend to be underarousable. The difference may have to do with biochemistry. Researchers have found, for example, that thrill seekers generally have lower levels of a chemical that enables those neuronal impulses to jitter-jog across the brain. Both Little-t and Big-T types try to negotiate their physiological response to some preferred middle ground, according to Farley, either by avoiding stimulation or by seeking it. For Big-T's, something new or risky gets the nervous system humming along at a more gratifying rate.

People who ride roller coasters probably aren't as far gone toward the Big-T end of the scale as mountain climbers or skydivers, Farley said. The coaster, after all, is still in control and the kinds of thrills it provides have "low lethal implications." The coaster thus may merely provide a Big-T breakout for otherwise Little-t lives—a three-minute burst of stimuli to remind us that sitting home watching television and waiting for one's pension isn't what it's really all about.

Out on the Beast, I took a ride with a spry, 60-ish, Texas-born Big-T type named Lucy White. White told me that when she can't ride coasters, she likes to drive up on overpasses, wait for the light to turn green down below, and then (this is not a recommended activity)—she winked and made a full-speed-ahead gesture with her hand. I asked her why she rode coasters, and her blue eyes widened at the obviousness of the answer: "For the thrill of it!" It was getting late and some cold April weather was moving in. "I think if it snowed, it'd really be something," she said. "To ride the Beast in the snow and the dark. Oooh!"

By the time we were hurtling down the 18-degree slope toward the helix, it had begun to rain a little. This was going to be my last ride on the Beast, and by now I had learned to unlock my grip on the lap bar and let the thing throw me around some. I had my arms up the way coaster enthusiasts ride, and I was teetering between terror and ecstasy, like those martyrs I'd seen earlier in the day on King Cobra. Then suddenly I realized that the trim brakes weren't slowing the thing down the way they should, and I remembered something an enthusiast had told me about how coasters run faster in the rain. We were shuddering wildly now. Everything was happening much too fast. This time, this time for sure, we were all of us going to die. I squeezed my eyes shut. The last thing I heard, in the hell-roaring of the tunnel, was the sound of Lucy White whooping her Texas heart out.

Inscribing an arc against the sky, Magnum XL-200 looks almost toylike in descent from height of 201 feet.

Article and photographs by Fred Bavendam

Even for ethereal phantasms, it's a dog-eat-dog world

Beautiful as butterflies, the nudibranchs give as good as they get, using acid, poison and usurped stinging cells to deter would-be diners

They look like the creations of talented children, like exercises in imagination. They come mostly in bright colors, decorated with such profusions of undulating flaps, sensory organs and waving forests of "fingers" that it is difficult to tell which end is which. Delicate, seemingly unprotected, they are beautiful to look upon, the underwater analogues of butterflies. Yet they, too, are animals, surviving in an eat-or-be-eaten world, sometimes predator and sometimes prey. More, they have taken an evolutionary gamble, giving up the protection that has always sheltered their kind, and appear to have won handsomely.

The filigreed creatures on these pages are sea slugs, photographed under water not just as pretty subjects but as living things engaged in the battle for survival. We see them defending, attacking, eating, hiding, retreating, stinging, swimming. All are carnivores, as far as we know, slow-moving, voracious predators consuming prey that are still slower or that do not move at all. They belong to the subclass of mollusks known as opisthobranchs. The group includes the sea hares, bubble shells and pteropods, but by far its most-numerous and best-known members are the nudibranchs (literally, "naked gills": in most species the gills or branchial plumes are outside the body).

All sea slugs have the rasplike tongue called a radula; all have a fleshy "foot" that propels them forward either by muscular contractions or by the concerted movement of hairlike cilia on the bottom of the foot. The subset of nudibranchs, the vast majority of the subclass, carry on their heads a pair of sensory organs called rhinophores.

Basically these are snails with a difference. They have given up the protection of a hard shell in their adult stage. Instead they use a wide array of defenses to protect their soft bodies in an ocean of hungry predators. The lack of a shell makes them more mobile. Most still creep along the bottom, but many can swim, at least enough to move around looking for a mate or to escape from a predator.

Even without a shell to slow them down, however, most nudibranchs do not depend on flight. Instead they stand their ground, betting their lives on camouflage or chemical warfare. Bright colors can be used to warn predators that they are noxious or even toxic—or

In this sequence, taken in Pacific waters, rainbow nudibranch (red filigreed creature), first encounters sea anemone that has fully extended itself out of its tube. The nudibranch can see light and dark, but finds prey mostly by touch. It then slowly rears up like a cobra to strike. The nudibranch will hold on with its large jaws and be pulled down into the anemone's tube (right). There it will eat victim's tentacles at its leisure. This nudibranch is large, about ten inches long; most species are smaller.

When a sunflower sea star, also hunting blind, encounters it on bottom, nudibranch becomes prey.

Bright-red nudibranchs (globes at center) are highly visible—unless they "hide" on a bright-red sponge.

to hide: a bright-red nudibranch "disappears" when it stations itself on a bright-red sponge. The nudibranch often acquires its color from what it eats. That red nudibranch is eating that red sponge. The bright pink of *Hopkinsia rosacea,* a Pacific coast nudibranch, results from a unique carotenoid pigment, hopkinsiaxanthin. The only other place this pigment is found is in the bryozoan *Eurystomella bilabiata,* which just happens to be the sole food for this nudibranch.

Chemical warfare is the weapon of choice for many nudibranchs. Some secrete acids, which produce a sensation that most—but not all—fish find extremely distasteful. Others secrete toxins, some so powerful that a single nudibranch placed in a bucket with fish or crabs will kill them in about an hour. (In normal circumstances, the predator receives a small dose: enough to repel but not enough to kill.)

A group of nudibranchs known as the aeolids borrow the weapons of others. They feed on another category of marine invertebrates, the coelenterates, especially hydroids and sea anemones. These in turn are unique in that they produce nematocysts, small capsules that can discharge a tiny coiled, hollow thread, something like a whaler's harpoon. One type of nematocyst pierces the skin of the victim and injects a toxin (this is how jellyfish, another group of coelenterates, sting swimmers).

When an aeolid nudibranch eats hydroids or sea anemones, it can ingest the nematocysts without ill effects. The nudibranch's digestive system neutralizes the mature nematocysts, but it passes the immature ones to the special sacs at the tips of the "fingers," or

Nudibranch doubles over and, leaping up and away from danger, swims by undulating from side to side.

Like a graceful costumed dancer, the intended prey covers a short distance before drifting back to the sand.

cerata, where they develop into full-blown weapons. The cerata are often the most brightly colored part of the nudibranch; they may draw attention to themselves and away from the animal's head and vital regions. A fish that nibbles these appendages receives a mouthful of nematocysts, in addition to some foul-tasting secretions, and rapidly loses interest. The nudibranch crawls away on its gastropod foot and quickly regrows any cerata that have been lost. (Some nudibranchs have the disconcerting ability to sever any of the cerata a predator may happen to grab, much as some lizards can leave their tails behind, occupying an attacker while they make their escape.)

They must be doing something right. Approximately 3,000 species of opisthobranchs are known, about 2,500 of these being nudibranchs. Sea slugs are found in all the oceans of the world, from the polar regions to the tropics, and in virtually every type of habitat. They range in size from individuals small enough to crawl between grains of sand to the black sea hare, one of the world's largest gastropods, which grows to a length of 39 inches and weighs 30 pounds.

Despite this evolutionary success, and their armamentarium of defenses, nudibranchs do not live charmed lives. Crabs have been seen carefully picking the cerata off aeolids before eating them. And some opisthobranchs live primarily by eating other opisthobranchs. But a defense mechanism can be considered a success even when an individual nudibranch is killed and eaten: if the experience is so unpleasant for the victor that it avoids nudibranchs in the future, then the whole species is that much better off.

There is more to life than who is trying to eat whom, of course, even for shell-less gastropods under water. The question of where little nudibranchs come from is as paramount for them as the question of babies is for us. Somehow it is not surprising that these gaily colored fantasy creatures have evolved interesting ways of dealing with a universal challenge.

All opisthobranchs are hermaphrodites; every individual possesses active sex organs of both genders. Any member of a given species can mate with any other member. In most cases, two nudibranchs position themselves head to tail, so that their right sides are touching, and exchange sperm; both are fertilized. Groups of sea hares form long mating chains, with each animal acting as a male to the one in front of it and as a female to the one behind. *Onchidoris bilamellata,* the barnacle-eating nudibranch, is reported to sometimes congregate in the thousands in great mating groups. Eggs are laid in gelatinous masses, which are attached to a hard surface.

The eggs of most nudibranchs hatch into free-swimming larvae, moving with the other plankton and dispersing along the coast. At this stage they do have the shells normal for their class. But after a variable length of time they settle to the bottom, often directly onto an individual of the species upon which they will feed as adults. They metamorphose into juveniles, without shells, and finally into adults.

Mr. Bavendam is a New England diver who does much of his work in British Columbia. His article on sea stars appeared in SMITHSONIAN, *November 1985.*

A sunflower sea star bumps up against what should be easy prey, an aeolid nudibranch a fraction of its size (top). Sea star lifts one ray as it moves in for the kill and, in the third picture, lays it on its intended victim in the start of a deadly embrace. Suddenly the sea star jerks its arms away (at bottom). Nudibranch has prudently ingested nematocysts, or stinging cells, during its own grazing on still smaller invertebrates. It has stored those cells in appendages on its back and now inflicts pain on the attacker.

The inflated appendages of the alabaster nudibranch (opposite, top) break off easily, just like a lizard's tail, allowing it to escape. The closely related golden dirona (at bottom, left) is usually found in winter, while its paler cousin is often found in summer. Like other members of its order, the Spanish shawl nudibranch (bottom, right) incorporates pigments from its prey. Species feeds on orange hydroids, which give color to parts of its body.

Red-gilled nudibranch climbs out on a limb, so to speak, to graze the tentacles of a tubularian hydroid.

Attacking the white sea pen is a *Tritonia diomedia*, a nudibranch used in neurophysiological research.

Orange peel nudibranch, the warty, frilled organism at the left, feeds on a "presliced" yellow sea pen.

There is a lot we do not know about nudibranchs, including what some of them eat. They are hard to study because they tend to be transitory; unlike most marine invertebrates, they cannot be depended upon to be there when you want them. Biologists have recently begun to study the role of nudibranchs in ecological communities. They do not themselves dominate, it seems, but in at least some cases determine which other organisms will or will not dominate. The shag-rug nudibranch, for example, which is found along coasts throughout the Northern Hemisphere, feeds on sea anemones, especially *Metridum senile*, the frilled sea anemone. *Metridum* is a long-lived, cloning species that can dominate considerable space in intertidal communities by outcompeting other sessile organisms (animals that "root" themselves to one spot, such as barnacles and oysters). Both laboratory and field studies now suggest that predation by the nudibranch prevents monopolization by the anemone and opens up areas to other species, thereby increasing diversity. The large number of sponge-eating nudibranchs may have a similar effect on the Pacific coast, where sponges are a potential dominant.

Opisthobranchs are more than pretty, biological curiosities. Humans, as always, have found uses for them. Not many are edible; only one nudibranch, the tochni, has been eaten regularly—by Aleutian Indians and the inhabitants of the Kuril Islands in the Soviet Union. Other opisthobranchs, especially the sea hares, have been used in Chinese medicine.

Opisthobranchs are most valuable for humans, however, in neurophysiological research. Like the fabled squid that has revealed so much to researchers, some of them have nerve cells of immense size: nearly a millimeter in diameter in the California sea hare. The neurons are not only big; they are so consistent in their position and coloration that corresponding cells can be readily located in different individuals. Physiologists can thus be sure of what they are finding, especially as they link specific nerves to complex body actions. One species has been so heavily collected in fact, that in some places, few full-grown adults can be found.

In the end, however, it is neither neurological advances nor the promise of better ecological understanding that makes these little mollusks so popular with biologists and divers. They are so colorful, their shapes so wonderfully improbable, that we need not ask what good they are. There is indeed more to nudibranchs than meets the eye. But what meets the eye is more than enough.

Flared skirt rippling, Spanish dancer is one of the best-swimming, largest nudibranchs—here a 10-incher

By Michael Kernan

William and Henry Walters, and their fever for the fine arts

An extraordinary legacy of father and son, Baltimore's Walters Art Gallery stands as a labor of love fueled by lots of money

In a way, the Walters Art Gallery of Baltimore is a museum of a museum.

Here, in a specimen room full of 200-year-old Italian paintings, you could believe you were visiting the collection of some 19th-century industrial giant: the massively framed paintings are arranged in tiers almost to the ceiling. They are lush works by the likes of Tiepolo, Longhi, Guardi and "follower of Canaletto," academically correct, handsome portraits of popes and cardinals and elegant noblewomen, romantic views of the Colosseum and the Forum, genre scenes in Venice and the Italian countryside. In front of each wall, like a general leading his troops, stands a small bronze sculpture writhing with nude figures.

The light is soft and yellow, like candlelight. Which is right, because not only were many of these superbly finished works painted by candlelight, they were designed to be seen in the same saffron glow.

This is how the gallery must have looked when it opened in 1909, a distillation of the tastes of a remarkable father-and-son team: William Walters, a self-made railroad millionaire who spent his first $5 on a painting; and Henry, a man of the world who lived for years in what looked like a ménage à trois, yet was too shy even to attend his own opening gala.

Its paintings skied above mahogany wainscots, intimate 18th-century collections gallery evokes 1890s salon.

Photographs by Jack Kotz

Green Gallery is rich in Italian High Renaissance and Mannerist paintings. Lighting is state of the art. Gallery holds works by Bellini and Veronese, among others. Huge painting (center) is Vasari's *Jacob's Dream*.

But what is the source of light in here? It certainly isn't candles. Gradually we realize that we are in the presence of a sophisticated system of lighting: a state-of-the-art orchestration of wall-washing lights, low-voltage spotlights directed at individual objects, an elaborate skylight with ultraviolet filters to protect the canvases, and sun-sensing louvers. While the Walters has gone out of its way to show how a 19th-century art gallery looked, this is one up-to-date place, gleaming from a $6 million renovation completed last year.

It's hard to imagine using the word "visionary" to describe a renovation job, but that is what this is, an extraordinary exercise in esthetics. Take the grand painting galleries; two stories high, they cover 8,400 square feet. The Italian works of the 13th to 15th centuries, many painted with gold-on-red backgrounds, now reside on deep-red walls. The original wall surface, lumpy, stained and flaking, has been stretched over with cotton damask, which allows the pictures to hang perfectly.

Washington freelance writer Michael Kernan covers diverse subjects for SMITHSONIAN, *most recently George Washington's first Inauguration last June.*

The next room is devoted to High Renaissance and Mannerist works and is in green, bringing out the blues and greens in the paintings. Beyond that is the Gold Gallery, where glittering fabric contrasts with the deep chiaroscuro of its Baroque paintings.

In each room, the visitor's eye is led immediately to a key work that seems to sum up its era. In the Red Gallery a fine 13th-century crucifix, and, at the far end, suggesting the transition to the Green Gallery, a remarkable 15th-century imaginary cityscape reminiscent of De Chirico. And here in the Green Gallery we find Sofonisba Anguissola's touching portrait of 9-year-old Marchese Stampa, dated 1557. His father had just died, leaving him with a man-size sword and a haunted face. Sofonisba, one of the few noted female painters of her day, achieves quite a modern look—clean, laconic and glowing with life.

"Henry Walters grew up with galleries like these in Europe," says Howard White, director of public relations. "Places like the Pitti Palace [in Florence] and the Palazzo Balbi in Genoa. He copied their spaces and high ceilings covered with putti, those winged little boys. What he produced was one of the great interiors on the East Coast."

Red Gallery displays late Gothic paintings and early Italian Renaissance works, including, to the left of the archway, Filippo Lippi's *Madonna and Child.* Walls are covered with Renaissance-design damask.

An interesting man, Henry Walters. But it is hard to learn much about him from the collection itself. "It's very frustrating," says gallery director Robert Bergman. "The man's judgments on art have to be taken from what we see. What we see are collections in depth: not just one Limoges enamel of the 12th or 13th century, but 120; not one Gothic ivory, but 130 . . ."

To understand Henry we first have to know something about his father. William Walters was born in 1819 in Liverpool, Pennsylvania. His father, a small-town merchant, had died bankrupt in Liverpool, but William liked to say he was from Thompsontown, where his mother's family, the Thompsons, were leading citizens. William studied in Philadelphia to be a mining engineer and went to work in a foundry, perhaps earning his first $5 there. (The picture he bought, *Napoleon Crossing the Alps,* by an obscure Swiss named E. A. Odier, was sold from the collection years ago.)

William has been described as a rough diamond, at any rate an energetic 19th-century businessman typical of the tycoons of the period, and apparently it was his genteel mother as well as his wife, Ellen Harper, a prosperous merchant's daughter from Philadelphia, who got him interested in art.

"He came down from Pennsylvania as a flour merchant, but then he went into liquor," says William Johnston, the gallery's associate director and a curator, who is working on a biography of both Walters men. "He brought cheap rye from Pennsylvania, sold it in Baltimore. His brand was Baker's Rye, one of the major rye whiskeys in the country."

William was only 21 when he set up shop. His basic insight was that the new canal along the Susquehanna River would bring about booming trade between Baltimore's port and inland Pennsylvania. Then he realized that railroads were an even better bet. Starting with investments in the Baltimore and Susquehanna Railroad, he gradually expanded his interests, consolidating small, bankrupt lines one after another. These culminated in the Atlantic Coast Line Railroad, and an empire on tracks that served the Southeast and was affiliated with lines reaching from the Rockies to the Gulf of Mexico to the industrial Northeast.

At first he collected works of artists he knew, notably the local sculptor William H. Rinehart, whose busts of Ellen Harper Walters and their daughter, Jennie, dominate the American gallery. And when William Ranney, another painter friend, died, Walters paid top

Analytical *Portrait of Marchese Massimiliano Stampa,* 1557, is a Mannerist work by Sofonisba Anguissola.

Henry Walters bought Manet masterpiece *At the Café* to round out collection; he favored earlier artworks.

prices at an auction to benefit his widow. He started looking at French work about this time, but it was the Civil War that set him to collecting European art.

When the war broke out, Walters found himself in a rather ambivalent position. He had many railroad and other financial commitments in the South, and was a proponent of states' rights; even before the shooting began he had protested the use of the railroads to move federal troops into Washington.

Then a friend, a Texas Senator, called for help. His two daughters were stranded in Boston where they were attending school. Could Walters somehow get them across the Mason-Dixon line? Well, certainly. He gave the girls a dinner party in his Baltimore home (with a tiny Confederate flag beside each plate) and took them to Harpers Ferry, West Virginia, where they crossed the border.

This was a time when many of Baltimore's residents were sympathetic to the Confederacy—even the mayor and police chief were arrested. Within a couple of weeks, William Walters applied for a passport, and soon afterward he and his family sailed for France for the duration. Not long after their arrival, Ellen Walters contracted pneumonia, and she died within a

few days. William was left with teenage Henry and 9-year-old Jennie.

Just how early the father and son collaborated is not known, but they did go to London in the early 1860s to see the Sir Rutherford Alcock collection of Chinese and Japanese art. William started to build an imposing collection of French painting, including works by Millet, Corot and Daumier, whom he commissioned to do four watercolors, the famous series portraying first-, second- and third-class carriages (below), and *The Omnibus*. He also took up the animal sculpture of Barye, eventually acquiring more than 150 bronzes.

In 1865 the family returned to their home on Mount Vernon Place in Baltimore. The following year they purchased a 150-acre farm, St. Mary's, on York Road just a few miles outside of the city in Govans; it had a lake, a bowling alley and a stable of Percherons. St. Mary's soon became the place where they spent most of their time except for the winter months. Henry—known as Harry in those days—went to Georgetown University and spent summers at the farm or traveling abroad. He continued his studies at Lawrence Scientific School, which was Harvard's school of engineering. It was there that he introduced his sister to his friend Warren Delano. Their romance was secret, her father being strongly opposed to the idea, and the very social Delanos sniffing at the Walters mansion as "that depressing, dusty museum."

Indeed, since before the war William Walters had let local artists visit his collection, hung all over the walls of his city residence. In 1877 he began letting in the public on three days each week during the spring months; it was simply too hot in the summer. People paid 50 cents apiece to benefit the poor, and bought their tickets at Baltimore stores.

Walters, bluff and unaffected, took an eager interest in everything that he encountered. He was an enthusiast. When he wanted to publish some brief but elegant monographs on Percherons or Oriental art, he naturally immersed himself in the world of small private presses. When he just *had* to have a certain Ch'ing peach bloom vase (below), made in the early 18th century during the reign of Emperor K'ang-hsi, he paid $18,000 for it—and created a scandal.

The press got hold of what was then called the "Peach Blow Vase" story and made it a household word. The thing was beautiful, all right, but it was put forward as a symbol of the excesses of the very rich, for in those days a person could live for years on $18,000. It was only eight inches tall. Some journalist even wrote a "Ballade of the Peach Blow Vase" that was a bigger hit than "Casey at the Bat" for a while.

When William died in 1894, Henry (no longer Harry) turned to serious collecting. He had his father's knack for coining money and doubled his wealth in railroads and banks, eventually acquiring the reputa-

Honoré Daumier's *First Class Carriage* was one of four watercolors commissioned by William Walters on the theme of public travel.

Walters also acquired a peach bloom vase from 18th-century China, priceless now. He caused a furor by paying $18,000 for it in 1886.

Photographed c. 1928, Henry Walters, who deepened the collection, had opened gallery 19 years earlier.

Portrait of William Walters is by Léon Bonnat and is dated some ten years before Walters' death in 1894.

tion of being "the richest man in the South," able to spend up to a million dollars a year on art.

Of course, Henry being Henry, the Walters fortune was never flaunted. He spent his time shuttling between quarters in Manhattan; Wilmington, North Carolina; and Newport, Rhode Island; cruising on his steam yacht, *Narada*; or traveling in Europe. He was best known in Baltimore for building public bathhouses. Though he served for years on the board of the Metropolitan Museum of Art in New York (consistently refusing the chairmanship) and anonymously donated many important artworks to that museum, he delighted in walking straight through a crowd of reporters, unrecognized, when he went to a board meeting.

New York was shocked when he left his 22,000-piece collection and building not to the Metropolitan, but to the people of Baltimore. New York might also have been shocked at his living arrangements. It so happened that Henry got on famously with Pembroke Jones, a rich rice planter from Wilmington, and Jones' wife, Sarah. The three went everywhere together. Henry moved in with them in New York. He took them all over the world—they sailed to St. Petersburg in Russia on the *Narada* and docked next to Kaiser Wilhelm II's yacht while Henry bought his first Fabergé pieces, a couple of parasol handles. After Pembroke died in 1922, Henry, at 74, married Sarah.

Sarah was known in society as "the woman with two husbands," but there is in fact no evidence that the three were anything but jolly good friends. Jones was an extrovert who loved parties and practical jokes. Henry Walters must have found him the outgoing, free-and-easy type he could never be. In any case, the Joneses and their children, along with his sister's children, the little Delanos, were Henry's family.

Yachting was plainly one of Henry's great loves. In fact he was for years a major backer of the America's Cup entry in the yacht races against Sir Thomas Lipton (SMITHSONIAN, August 1980).

The trio took up Newport, then in its heyday as a resort. Sarah Jones, arriving on the *Narada*, promptly gave a little party for $200,000. Another time, at her palatial residence in Wilmington, the weather was so stifling that she built platforms in the trees for her guests and placed giant blocks of ice on the lawns.

Through it all, Henry remained imperturbably retiring. He liked to carry three priceless pearls in his coat pocket and fondle them, causing one art dealer to ask if he had a crippled hand. At boring board meetings he would take out a palm-size, illuminated Book of Hours

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—worth probably six figures today—and peruse it. He loved those gorgeous old manuscripts, painted in fine detail in medieval monasteries. Of his 600 or so Western European illuminated manuscripts, nearly half are Books of Hours.

His delight in tiny, exquisite things shows everywhere in the collection, especially in the Treasury Room with its Lalique and jeweled Tiffany extravaganzas. But he could think big, too.

Consider the Massarenti episode. At one stroke in 1902, Henry Walters bought out an entire Roman palazzo, including 500 Italian Old Masters, seven newly discovered Roman sarcophagi, and many other Roman and Etruscan pieces. They were owned by Don Marcello Massarenti, a high papal official, and they had made his Palazzo Accoramboni a byword in the art world. Henry had to charter a ship to bring the collection home—there were 1,540 items. Art experts lifted eyebrows, for Massarenti's reputation as a collector was not the best, and they snickered a bit at the price, five million francs. Many of the works, they said, were fakes. On top of this, the Italian government demanded a 21 percent export tax.

Now, Henry might have been shy, but nobody ever said he was dumb. Grandly, he turned over to the Italians a Raphael, a Giorgione and a Philippe de Champaigne, the big stars of the collection. The Italians, mollified, considered the tax paid.

All three paintings were later proved fakes.

As it happened, Henry was a connoisseur of art forgeries and had a special collection of them, some to be sure the result of his mistakes, but "occasionally he bought pieces knowing they were forgeries," William Johnston says. "He wanted them for their educational value." (The gallery has actually had a major show of forgeries that is now touring the country. Called "Artful Deception: The Craft of the Forger," it will be at the Dallas Museum of Art, August 27-October 22; at the Oklahoma Museum of Art, February 11-April 8, 1990; and at Maine's Portland Museum of Art, May 6-July 1, 1990.)

"It wasn't until nearly 70 years later," Robert Bergman observes, "that people grasped what the Massarenti collection really was. Many of the works hadn't been conserved, some were misattributed and so on, but when Italian art expert Federico Zeri came out with a complete catalog, it made Henry a hero."

It didn't matter that the sellers had mistakenly claimed work by Michelangelo, Leonardo and Botticelli, claims that had made would-be buyers leery. "Henry saw this," Bergman says, "but he also saw that the rest of the pieces were extremely important, if not as famous. He must have had guts."

Henry had bought a stunning group of 16th-century Mannerist paintings, little appreciated at the time, and many top quality 13th- and 14th-century Italian works. He was not so comfortable with modern art.

In 1904 Henry started work on a gallery behind the house, in the shadow of the George Washington monument on Charles Street. It was designed by William Delano and when it opened in 1909, First Lady Edith Roosevelt attended. Henry, always in character, didn't

To left of archway in the Green Gallery is Lavinia Fontana's *Portrait of Lady with Lapdog.* Fontana (1552-1614), a prominent woman of the time, was an official painter to the papal court of Clement VIII, and also a noted portrait painter of noblewomen.

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Director Robert Bergman, 44, is devoted to scholarship and audiences for fine art, and is a teacher as well.

show up. (If he is not so well known a philanthropist as, say, Andrew Carnegie, it could be because he often gave in the names of others. He donated the main building of Georgetown Preparatory School, for instance, in the name of his class.)

Though he still lived mainly in New York, he visited Baltimore every month for board meetings. Discussing this period of his life, when Walters was chairman of the board of the Atlantic Coast Line, Johnston says: "How much does a man like that actually work at his desk? He doesn't sit in his office. He does business at his clubs and while traveling."

The tradition of opening the museum three days a week in spring continued right up to 1934. Henry had formally bequeathed the gallery, which he looked upon as a monument to his father, to the people of Baltimore at his death in 1931.

The expansion he had planned was postponed by his death and then by the Depression, and it wasn't until 1974 that a huge new wing was added, housing ancient, medieval and 19th-century art. Even with the addition, problems remained. The '70s recession hurt. Fuel costs rocketed. The staff was small and ill paid.

The turnaround began in the early '80s when the gallery's trust fund made a dramatic comeback and contributions from city, state and private sources increased considerably. The great renovation finally got the two buildings connected efficiently. It also rehabilitated the lovely inner court (opposite), a replica of the 17th-century Palazzo Balbi (the director visited the original in Genoa specifically to capture exactly the right shade of timeworn apricot), installing its rows of marble busts on pedestals of varying height to give the viewer a uniform sight line.

The work isn't done yet, either. In the spring of 1991 a whole new Asian art museum will open in what was the Hackerman House on the corner of Charles and West Mount Vernon, a historic 1850s mansion built for the Thomas family of Baltimore. The $7 million Museum of Asian Art has a collection of 7,000 items of sculpture, lacquerware, porcelain, and paintings that William and Henry Walters bought over the years. (William was one of the first Americans to form a major collection of Chinese and Japanese porcelain, beginning in 1862, only eight years after Admiral Perry opened up Japan.) Very little of this art has ever been seen before by the public, though the breathtaking little K'ang-hsi vase, delicate as a petal, is already on view in the 1974 wing of the art gallery.

"We still have virtually all of the Asian porcelain that William collected," says Bergman, "and as for the collection of 19th-century paintings, which also remains intact—he often bought directly from the artist or agent or at a first auction of works, so most came to the collection in pristine condition—they jump off the wall at you. Even the frames are originals."

When the 1974 wing opened, the gallery was able to shift from its policy of showing only 20 percent of the works to displaying some 60 percent. "The staff thinks of itself as a faculty, and the visitors our students," Bergman says. "Our collective intelligence is our greatest resource.

"We didn't want just a series of ephemeral events, like so many museums," Bergman continues; "that wasn't our mission." Basically, the Walters designs a project based on some of the 30,000 objects in the collection, then turns the light of research on it, eventually producing a major show and, perhaps more to the point, a world-class publication.

As one might expect, the Walters features all sorts of classes, lectures and tours. It counts itself as one of the significant museums in the country. "But the difference between the others and us," says Bergman, "is that the great majority of what you see here was collected by just two people. And most of that by Henry."

The man may have been so modest that (to the irritation of historians) he cut out the price listings on everything he bought. But he left his mark, all right.

Cool, marmoreal space of Renaissance Sculpture Court was inspired by 17th-century Palazzo Balbi, Genoa.

By Robert Wernick

A shifty-eyed spy who was likely the nastiest man ever

In many ways, Maj. Ferdinand Esterhazy was to blame for starting the 'Dreyfus Affair,' France's most appalling miscarriage of justice

On false evidence, Dreyfus was convicted as traitor, then vilified and cruelly caricatured for years.

Lieut. Col. Maximilien von Schwartzkoppen was an aristocrat of the old school, urbane, cultivated, charming and terribly careless. When the papers piled up too high on his desk at the German Embassy in Paris, he would crumple or tear them up and toss them into his wastebasket.

During the years he served as military attaché there, from 1891 to 1897, the colonel never suspected that Madame Bastian, the dear old charlady who cleaned the embassy offices, was leading a double life as agent "Auguste" of the French intelligence service. She was supposed to burn all the wastepaper but, at regular intervals, in clandestine meetings in the gloom of church chapels, she would pass over a bag full of papers to Maj. Joseph Henry of the Statistical Section, which was in fact the French Army's counterintelligence service. In their cramped quarters on the Rue St. Dominique, the five dedicated men who made up his unit would piece the scraps together, photograph and analyze them.

Most of the documents from von Schwartzkoppen's wastebasket were love letters. There were passionate exchanges with the wife of a Dutch diplomat and a whole squadron of ladies of high degree. There were also passionate, and in this case wildly obscene, letters exchanged with the Italian military attaché, Col. Alessandro Panizzardi. "Little red dog" and "little green dog" they called each other, and between the more intimate passages they sometimes slipped in items of business, such as their relations with Frenchmen willing to pass over a military secret or two for small amounts of cash.

Shameless crook and con man, "Count" Esterhazy did the deed that sent Alfred Dreyfus to Devil's Island.

The Statistical Section naturally read these documents with great interest. They were particularly anxious to identify the man referred to by the code name Jacques Dubois or on one occasion as "that scoundrel D," who for years had been selling the Germans plans of the fortifications of major French cities. But they never found a single clue. On September 27, 1894, however, a particularly juicy item came in from agent Auguste. It was a memorandum, a *bordereau*, written on onionskin paper, containing a list of items being offered for sale to the Germans, including details of the "120 short" cannon, a highly secret new weapon the French were counting on to take revenge for the humiliating drubbing given them by the Prussians in 1870. The author of the *bordereau* could only have been a French officer, one with connections to the General Staff. It was a flagrant case of treason and all the top military authorities were immediately notified.

Dreyfus, here with his children, was a loving father and passionate patriot.

Col. Joseph Henry and wife forged evidence and plotted against Dreyfus.

There had been a few similar cases in previous years in which soldiers and officers in the French Army had been caught trafficking with the hereditary enemy and been condemned to stiff prison sentences. Like most treason cases, they were tawdry little affairs, good only for a shocking headline or two, and they had aroused little interest.

This case was quite different. The gentleman in civilian clothes, wearing the ribbon of the Legion of Honor, who had presented himself in Colonel von Schwartzkoppen's office back in July 1894 was obviously an exceptional individual. He introduced himself as Major the Count Ferdinand Walsin-Esterhazy, a scion of the noble and immensely rich family that at one time owned one-eighth of the kingdom of Hungary. But he was in financial straits and, so he said, only the necessity of saving his wife and children from abject poverty had led him to take the contemptible initiative of offering his services to the German General Staff.

Esterhazy was serving in the 74th Infantry Regiment in the French Army. He was a decorated war veteran, a member of the Jockey Club, a friend of everyone who was anyone in Parisian society, an intimate of generals and cabinet ministers, a brilliant conversationalist, a clever journalist. He was also a compulsive gambler; a compulsive liar; a jewel thief; a blackmailer; a witty, learned, fascinating crook; and, it turned out, one of the nastiest men in the world. Women found him entrancing, and he liked to pick them up in the first-class compartments of trains. It was on the train from Le Havre to Paris that he met and won Marguerite Pays, who would help him forge documents and would remain faithful to him through thick and thin. On the other hand, after a miserably unhappy marriage, his wife—he had described her as a spendthrift and ninny whose only interest in him was "physical passion"—would divorce him in 1899.

The surviving photographs of Esterhazy show the face of a man whom Hollywood would have typecast as a riverboat gambler of the second class. But face-to-face, people found him brilliant. He had encyclopedic knowledge and a prodigiously agile tongue—the tongue that was his sole resource which enabled him to keep his creditors at bay and let him wriggle out of the hopeless situations that more and more formed the pattern of his life. He had a gift for making things up, for he was not a "Count," and though he did have Esterhazy blood, it came to him through the illegitimate daughter of an illegitimate son.

Col. Max von Schwartzkoppen's wastebasket yielded a crucial clue.

He loved nothing better than to play both sides of the street. Under the pseudonym Z, he wrote a chronicle of military gossip for *La Libre Parole*, the paper of Edouard Drumont, the leading anti-Semite of his day. He served as a second to a Jewish lieutenant who challenged Drumont to a duel. Then Esterhazy turned to an old schoolmate of his, a Rothschild, and wheedled a good sum of money out of him on the grounds that he was being blackballed for being a friend of the Jews. When his nephew Christian came into an inheritance, Esterhazy offered to put the money into promising investments. He put it into the stock market in his own account,

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selling short on the basis of inside information from his friends in high places and losing everything when the market rose. He explained to the poor nephew that his funds had been temporarily blocked by the malevolence of Jews.

If events had followed their normal course, the arrest and trial of this man on charges of passing classified matter to a foreign power would have provided the newspapers with weeks and months of the kind of spicy scandal newspaper readers love. But they took another turn. A series of chance events turned what was basically a minor, run-of-the-mill affair of espionage into the most famous miscarriage of justice of modern times. "The Affair," as the French call it to this day, was to last for 12 years. It would include three courts-martial, a colossal political and military cover-up that blackened the name of the French Army for decades, and years of passionately bitter debate. Governments would fall, careers would be ruined, the whole nation of France would be torn in two and the scars would not heal for generations. They have not, in fact, healed yet.

And all because a young officer visiting the Statistical Section made a suggestion that sent the investigators, who had just about given up hope of finding the author of the *bordereau*, off in a new direction. In a matter of hours they arrested the man they were convinced was the culprit. It was not Major Esterhazy, but another professional soldier who up until that day had been living in perfect contentment as a devoted family man, rich, conservative and conventional: Capt. Alfred Dreyfus.

During a humiliating public ceremony in 1895, Captain Dreyfus had his sword broken and was formally stripped of his rank.

Nobody had actually gone looking for Dreyfus. But when his name turned up on a list of officers who had served in sections of the General Staff with access to the information in the *bordereau*, it struck all the investigators as a gift from Heaven. Dreyfus' handwriting looked reasonably like that of the *bordereau*. His name began with a "D," the initial that had popped up in the von Schwartzkoppen-Panizzardi correspondence. And he was a Jew, which to a good part of the French officer corps meant that he was a foreign element in the nation, probably pro-German, and at all events ready to do anything for money.

The fact that the Dreyfuses were fanatical patriots who, in order to maintain French citizenship, had given up their home in Alsace after it was annexed by the Germans, was immaterial, as was the total absence of a motive. Dreyfus was a rich man who had no need for the few hundred francs von Schwartzkoppen was doling out for information. For that matter, he had access to much more sensitive material than the fairly commonplace stuff in the *bordereau*. There was also the troubling matter that no one could be sure the handwriting on the *bordereau* was really that of Captain Dreyfus. Two of the five experts called in to examine the document said he could not have written it. Of the three who said he did, one—the famous Alphonse Bertillon, father of modern criminology—struck most people who dealt with him as a lunatic: he would eventually spend years refining elaborate charts and diagrams to demonstrate that a diabolically clever Captain Dreyfus had actually *forged* his own handwriting.

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For his pro-Dreyfus writing, Emile Zola was grossly cartooned as a pig.

But to men eager to get a successful spy case behind them, these considerations were of no concern. The only thing that might have stayed their hand was the paucity of the evidence, which consisted, and for all the stormy 12-year course of the Affair was to consist, of that one highly equivocal piece of paper, the *bordereau.* It was Gen. Raoul de Boisdeffre, chief of the General Staff of the army, who insisted that it was necessary to *nourrir le dossier,* fatten the file. And so, to incriminate Dreyfus, over the years busy hands at the General Staff and the Statistical Section would add some 4,000 items to the dossier, all of them irrelevant and some of them forged.

In due course, Captain Dreyfus was dragged before a court-martial. A good deal of what followed has been much publicized. A "secret file" of innocuous but sinister-looking documents was smuggled into the judge's chamber without the knowledge of the defense. The defendant—a proud, stiff, shy man too dazed and too innocent to know what was happening to him—was found guilty of treason, condemned to being broken and stripped of his captain's insignia in a public ceremony (p. 118). In February 1895 Dreyfus was shipped off for life imprisonment in the worst place the French penal system could provide, Devil's Island off the coast of Guiana (SMITHSONIAN, August 1988).

Mr. Wernick has been writing about France, art, history and culture in SMITHSONIAN *for more than 15 years.*

From extreme left to extreme right, all the politicians congratulated the army authorities for the speed and efficiency with which they had acted to safeguard the vital interests of the nation. Except for the captain's wife, Lucie, and his brother Mathieu, who dedicated themselves to exonerating the captain, and one or two punctilious souls who were offended by the irregularities of the court-martial proceedings, almost everyone was satisfied.

There were three people who had reason to follow every detail of the affair with particular concern. Colonels von Schwartzkoppen and Panizzardi were puzzled and, within the limits allowed them by their official status, shocked. Von Schwartzkoppen protested to the French government that he had never laid eyes on Dreyfus, but no patriotic Frenchman was going to believe a word uttered by a representative of the German government. Panizzardi offered to testify to the same effect, and he was told to mind his own business.

As for Major Esterhazy, he must have breathed a sigh of relief. Unfortunately, financial circumstances were no better for him than when he first went knocking at the door of the German Embassy. His creditors were shrill, his wife's dowry had dribbled away, his bank account was down to 43 francs 78 centimes. He returned again and again to von Schwartzkoppen, but the colonel was dissatisfied with the quality of the material supplied and cut his rates. Borrowing the names of two of the oldest families of French nobility, Esterhazy, as Monsieur Rohan-Chabot, became a partner in a new luxurious house of prostitution opening on the Rue du Rocher. He had little capital to offer, but he could provide the names of 1,500 potential customers.

But times remained hard. And there was always the threat that the small but growing number of people who had begun to suspect that an innocent man had been sent to the hell of Devil's Island might stumble on the facts, and drag the name of Esterhazy out into the open.

On November 7, 1897, it happened. A stockbroker named Castro was strolling the boulevards and picked up one of the brochures that Mathieu Dreyfus had had printed in his brother's defense; it contained a facsimile of the *bordereau.* He recognized the writing—Major Esterhazy had dealt with him often, when he had some cash to speculate with. It was the first glimpse of hope to break through to the brave little band of what were beginning to be called "Dreyfusards."

What they did not know was that the French Army had known all about Esterhazy for 13 months. In March of the previous year the new boss at the Statistical Section, Lieut. Col. Georges Picquart, had come across a piece of express mail, the famous *petit bleu,*

Dreyfus' wife, Lucie, like his brother Mathieu, staunchly defended his honor.

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Key help came from lawyer Labori and honest Colonel Picquart (at right).

written by Colonel von Schwartzkoppen, ever careless, and addressed to Major Esterhazy. His curiosity piqued, he asked for some material on this officer, and was appalled—for he, like almost everyone else, took it for granted that Dreyfus was guilty—to find that Esterhazy's handwriting and that of the *bordereau* were identical.

A strictly honorable, though somewhat innocent man, he expected to start proceedings against Esterhazy immediately and right the miscarriage of justice. He did not realize that by now the French Army had accepted the guilt of Dreyfus as an article of faith. To challenge the findings of the court-martial was regarded by the French General Staff as an act of treason worse than selling a few papers to the Germans. "What difference does it make to you," reportedly snapped General Gonse, deputy chief of the General Staff, to Picquart, "if that Jew remains on Devil's Island?"

In practical terms, this meant that when presented with devastating information about an officer with a very bad reputation, the Minister of War, the General Staff of the army and the Statistical Section all collaborated in

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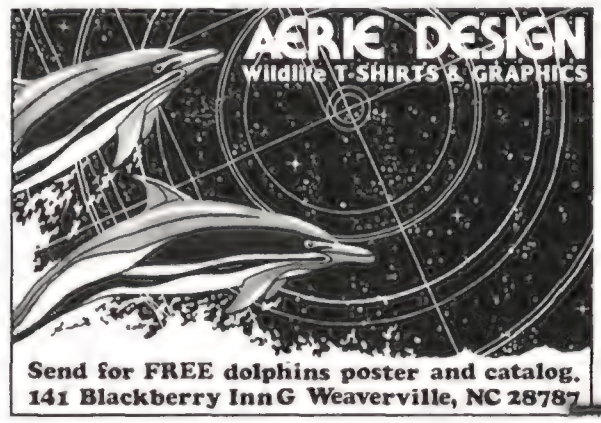

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protecting him. Troublesome Colonel Picquart was hustled off on a made-up mission to Tunisia to get him out of the way, and forged telegrams and an anonymous note from Esterhazy were actually sent to him (and intercepted) to suggest that he was part of a pro-Dreyfus conspiracy. With a little help from his wife, Major Henry, who had originally acquired the *bordereau* from Colonel von Schwartzkoppen's charlady, composed a letter signed "Esperance" warning Esterhazy that unscrupulous friends of Dreyfus were plotting against him. Thereafter Esterhazy was regularly informed of developments and coached in the proper attitude to maintain in case anything became public.

When, despite all the efforts of his friends, the charges against Esterhazy did become public, he never dreamed of adopting the low profile they advised him to take. He bubbled with righteous indignation that a French officer, son of a French general, should be the object of such calumny. At first he claimed that the *bordereau* was a forgery, painfully copied from words in a manuscript account of his father's heroic actions at the battle of Eupatoria, an account he had written many years before. When this story began to seem a little thin, he changed it to say that, of course, he had written the *bordereau* at the order of Colonel Sandherr, head of the Statistical Section in 1894, so that he could serve as a double agent. When asked to provide some documentary evidence, he would wave a letter that he said came from Colonel Sandherr's widow thanking him for all he had done. But he never let anyone close enough to the letter to read or copy it.

He wrote to the President of the Republic, threatening that if he did not receive satisfaction he would appeal to the feudal suzerain of the Esterhazy family, the emperor of Germany. He wrote the prime minister that if his good name were not restored and his enemies punished he would make public information that would lead either to war or national humiliation. He wrote at length about a mysterious veiled lady who, at great risk to herself, met him at dusk to hand over documents proving that he was the object of a plot led by the dastardly Colonel Picquart.

And for a while he got away with it. It was Colonel Picquart who was put in jail. Politicians and press hailed Esterhazy as an exemplar of the traditional French values, an honorable soldier pursued by a pack of ruffians. The army arranged to have him vindicated by a court-martial that ran roughshod over the evidence. By tortured logic, it was decided that precisely because the *bordereau* was in Esterhazy's handwriting it was clearly a forgery by someone else trying to frame him. After all, if he had written it, would he not have disguised his hand? He was found innocent of any crime of treason. When the verdict was announced, he was surrounded by hundreds of officers shouting, "Long live France! Down with Jews!"

Back from Devil's Island in 1899, Dreyfus was again tried before a French Army court-martial, this time at Rennes. Two of his lawyers are at right.

But every time he seemed triumphant, some new and damaging disclosure would be made. Once it was his cousin and mistress, Madame de Boulancy, despairing of ever seeing 36,500 francs he had borrowed, who decided to publish the letters that Esterhazy had written her over the years. For admirers of traditional French values, they made distressing reading. "If someone were to come tell me this evening that I would be killed tomorrow as a uhlan captain running through Frenchmen with my saber, I would certainly be perfectly happy.... Paris taken by storm and given over to the pillage of 100,000 drunken soldiers! That is a festivity I dream of!" Hardly had this scandal died

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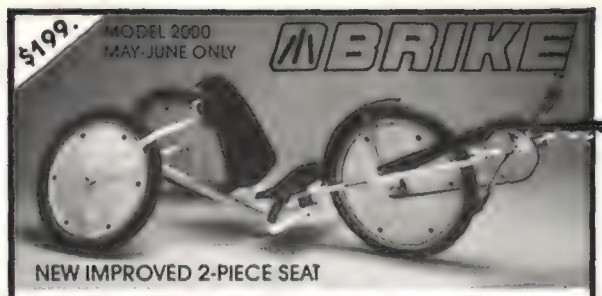
In an odd cartoon, Colonel Henry cuts throat with help from his accuser.

down a little when his nephew Christian, belatedly suspicious of what had happened to *his* money, began a lawsuit accusing his uncle of fraud.

Every detail of the affair was by now becoming public property, fresh fuel for the raging political debate that for a while threatened to tear the country apart. Families were divided, old friendships broken up, political debate poisoned. An extraordinary nastiness pervaded public life: when a high court handed down an administrative decision that helped the Dreyfusard cause, *L'Intransigeant*, one of the leading anti-Dreyfusard newspapers, recommended tying hungry spiders to the judge's eyes and letting them eat their way in.

Everyone took sides, and there were great names on both sides. Emile Zola took a special edition of Georges Clemenceau's newspaper *L'Aurore* to publish his famous open letter to the President of the Republic, "*J'Accuse*," breaking down the wall of silence that the French General Staff had built around the real details of the case in



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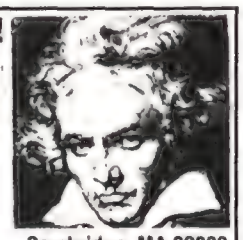

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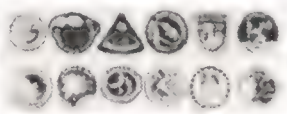

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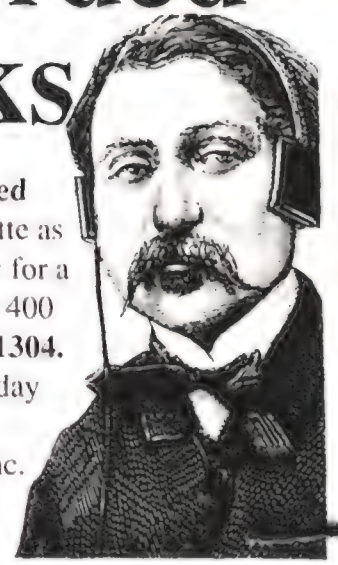

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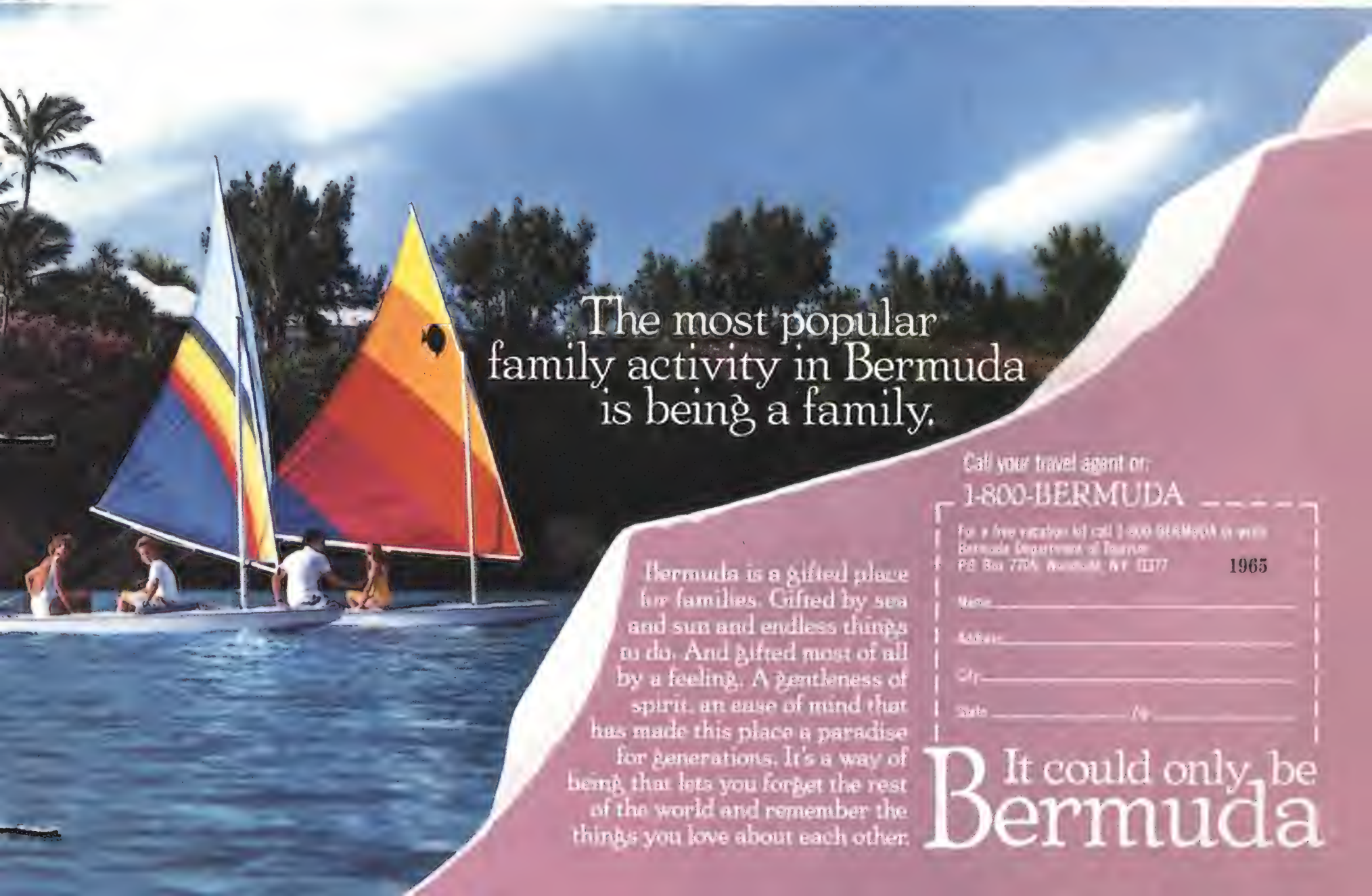
the name of state secrets and national security. The mild and skeptical Anatole France astonished everyone by the passion with which he fought for the release of an innocent man. But others, including Degas, Cézanne, Renoir and Paul Valéry, were all equally convinced of Dreyfus' guilt.

Meanwhile the prisoner lived on, now shackled to his bed at night, in a stifling cell, surrounded by a stockade to keep him from getting a glimpse of the sea. He remained throughout his career—to the dismay of many of his most fervent supporters—exactly what he had been before history came down to enfold him, a thoroughly conventional, conservative Frenchman, devoted to family, to honor, to the army, to *la patrie*. He always said that however great were the sufferings he endured, they should have been twice as great if he had been guilty of the crime with which he was charged. He never seemed to doubt that army and *patrie* would one day acknowledge that they had condemned him unjustly, and in the end he was right.

For despite the increasingly hysterical efforts of the authorities to bury the truth, it kept dribbling out. Colonel Henry (promoted for his loyal endeavors) changed a "P---" in one of the incriminating letters to a "D---," forgetting that the Statistical Section photographed all documents with strict bureaucratic regularity the moment they arrived. And so the original "P" remained in the archives while the forged "D" was being waved in the face of skeptical government ministers investigating the case. In a supreme effort to silence the skeptics, Henry took one of the letters, tore off the heading and the signature, and attached them to a new text of his own composition, one in which for the first time in the whole case all seven letters of the name Dreyfus were spelled out. On July 7, 1898, the new Minister of War, Godefroy Cavaignac, read this document to a cheering Chamber of Deputies, which voted to have copies of his speech placarded in every one of the 13,000 communes of France as proof positive of Dreyfus' guilt.

But a month later, the roof fell in, on Esterhazy and the Ministry of War alike. On the night of August 13, a captain on Cavaignac's staff, studying the doctored letter under slanting lamplight, noticed for the first time that the lines of the graph paper on which the body of the text was written were of a different color from those at the top and bottom. Cavaignac was thunderstruck. A man of integrity, he could not ignore the evidence as his predecessors had. He was determined to clean house, and the first thing to do was to get rid of Esterhazy. The military court of inquiry found him guilty of "habitual misconduct" and Esterhazy was thrown out of the army. "A monstrous abuse of power" by a pack of "cowardly and obscene scoundrels," was Esterhazy's comment.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Not until 1906 did the army reinstate Captain Dreyfus (front, with sword).

On August 30, Cavaignac summoned Henry to his office and mercilessly browbeat him till he broke down and confessed his forgery. Generals Gonse and de Boisdeffre, who had encouraged if not actually ordered him to do it, sat by without saying a word. The next day, Colonel Henry, loyal French officer and second-rate forger, wrote a confession of guilt and slit his throat in a prison cell.

At that moment the Dreyfus case was over, though Cavaignac and the generals and the anti-Dreyfusard fanatics refused to believe it.

After a moment of shock they rallied to maintain that Colonel Henry was a national hero and that Dreyfus was as guilty as ever. More clairvoyant than his friends, ex-Major Esterhazy knew that the jig was up. The day after the news of Henry's confession was made public, he shaved off his mustache and took the train, third class this time, for Maubeuge, slipped into Belgium and across the Channel to England. He would remain in England for the next 25 years.

It was a long, sad, painful and much deserved descent into oblivion. As the Dreyfus case dragged on to its inevitable end—through the return of Captain Dreyfus from Devil's Island,

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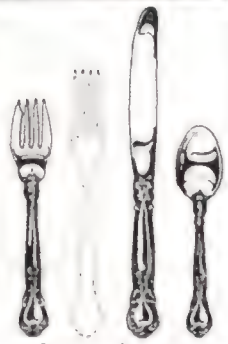

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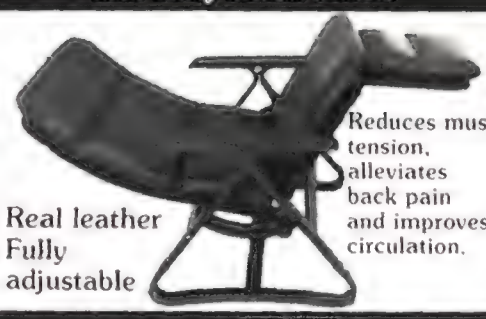

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through a second court-martial that ended in the incomprehensible verdict of guilty of "treason but with extenuating circumstances," through the annulment of the earlier verdicts in July 1906—Esterhazy was always available for an interview. With a remarkably gratuitous meanness of spirit, he told all he knew and made up much more. He derided French politicians and French generals as fools, fops and madmen. But there were no more intrigues, no more cousins to swindle.

Being Esterhazy, he managed to survive somehow. During World War I, in which Dreyfus, despite his ruined health, served for 20 months as an artillery officer, Esterhazy, under the name of Fitzgerald, wrote articles denouncing the total incompetence of the French Army.

When he died in 1923 in a village in Hertfordshire, no one knew who he was. He was described as a traveling salesman. He was going by the name of Count Jean de Voilemont.

After "L'Affaire," French artist Charles Paul Renouard depicted Esterhazy, then hiding out in London, as a theatrical villain.

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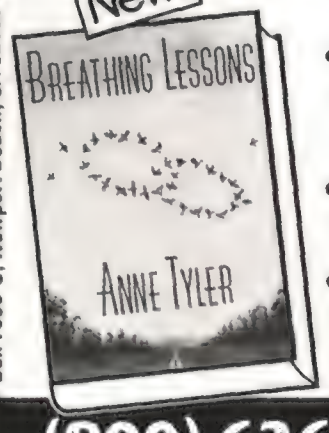

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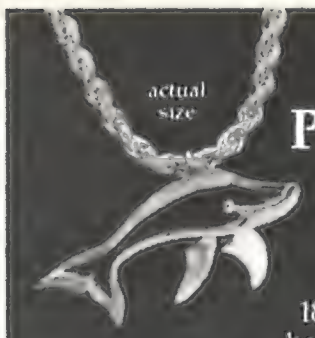
Book reviews

Complete Plays, 3 vols.
Eugene O'Neill
Edited by Travis Bogard
Library of America
$35 per volume; $100 boxed set

During 1988, the centennial of Eugene O'Neill's birth, there were productions of his plays all across the country, all across the world. On at least three continents there were conferences at which O'Neill scholars gathered to explore important and arcane aspects of the playwright's work. There was a spate of books by and about O'Neill, including *The Unknown O'Neill*, a collection of unpublished or not easily accessible writings, and *Selected Letters of Eugene O'Neill*. The most important publishing event, however, was the appearance on O'Neill's birthday (October 16) of *Complete Plays*, a three-volume edition in the Library of America. It is the first time that the work of a dramatist has been published in that eminent, elegant series designed to bring the best American writers to the general public, and it is fitting that O'Neill is the first playwright to be so honored. Although some critics complain that his language is awkward, that his ambitions are sometimes too large for the stage that must contain them, that he had a fatal attraction to repetition, even his detractors admit his preeminence. If the Grande Corniche could be straightened, it would be an easier road to drive, but then it wouldn't be the Grande Corniche, would it? So it is with O'Neill.

The best thing ever written about the limitations of O'Neill's language came from the playwright himself. Edmund, the O'Neill figure in *Long Day's Jour-*



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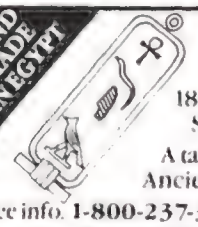

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ney into Night, responding to his father's suggestion that he has "the makings of a poet," says, "I just stammered. That's the best I'll ever do. . . . Well, it will be faithful realism, at least. Stammering is the native eloquence of us fog people." The repetition, particularly the recurring slang of O'Neill's youth, can grate on the reader or the viewer, occasionally make him want to scream, but that possible scream is part of the playwright's strategy. O'Neill repeats, not because he is afraid that the audience will not hear what he says the first four times, nor because he cannot think of variations on a phrase, but because he understands the verbal and ideational obsession of people and the impatience that each of us feels for the obsessions of all the others. Directors who decide to streamline O'Neill (to straighten the Grande Corniche) often cut deeply, discovering after their fast-lane version gets on stage that his plays are not vehicles that carry the audience toward a destination but bulky theatrical sweaters to wrap up in. Pull a loose thread and the whole thing may begin to unravel. The kind of problem that a director today needs to solve does not have to do with O'Neill's words, but with the complex visual effects that he calls for in his more extravagant works. No American company today could afford the 400 costumes and the 300 masks and wigs that the Pasadena Playhouse provided for the 1928 production of *Lazarus Laughed*, nor the 159 chorus members who wore most of them. If the play—that strange and absorbing consideration of the pervasiveness of life-denying fear—is successfully to reach the contemporary stage, some imaginative director will have to find a way to suggest the surging crowds and the bewildering shifts of loyalty among them.

For O'Neill—for any playwright—the test of his work is its continuing life on the stage. Plays like *Long Day's Journey into Night* and *Ah, Wilderness!*, the dark and the light sides of O'Neill's youth in New London, Connecticut (done back-to-back in New York during the centennial year), have become perennial favorites, but increasingly companies have turned to more difficult works, such as *The Hairy Ape* and *Strange Interlude*. O'Neill's sense of theater, learned in part from the kind of melodrama that made his actor father rich, has triumphed over any infelicity in his work. He is, as he ought to be, an important figure in the active repertory both at home and abroad.

Complete Plays, however, is for the reader, not the playgoer, although one hopes that every reader stages the works in his head as he goes along. Inevitably, in a collection such as this, there are plays of varying quality, some that one would dismiss if they were not by a dramatist of O'Neill's stature. The best way to read the collection, if you are already committed to O'Neill, is to begin on the first page of the first volume and go straight through the three volumes. If you are unfamiliar with O'Neill or uncertain how you feel about him, begin with the third volume, which includes the great plays of his last years, and then go back to the first volume to discover how the artificiality and preachiness of a play like *Servitude* (1914) could grow into the pain and passion of *Long Day's Journey* (1941).

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Julian Hirsch, Stereo Review, Sept. '88

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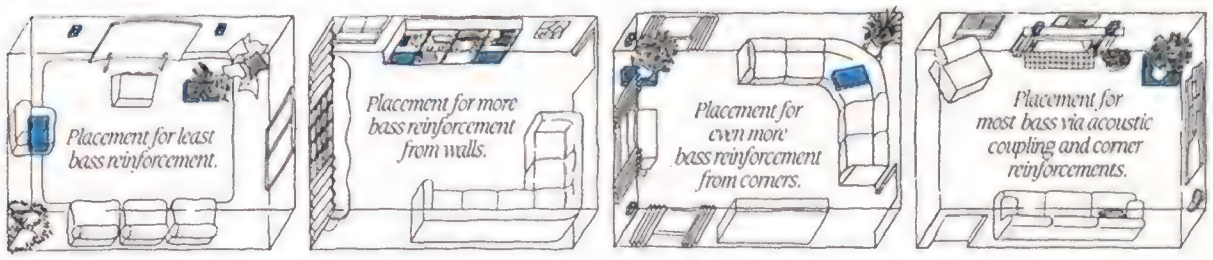
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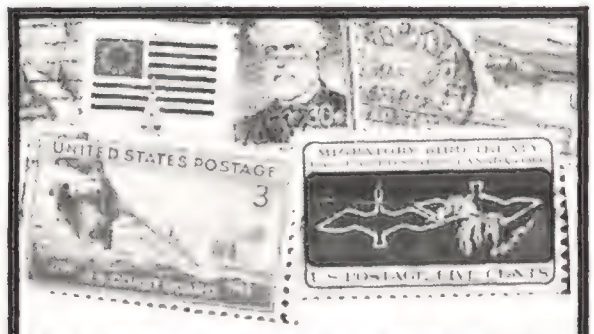

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of *Complete Plays*, which covers the years from 1913 to 1920. Most of them are one-acts and many of them are plays that O'Neill did not want to see in print or, in the case of the five works in the privately printed *Thirst and Other One Act Plays* (1914), republished in later editions. Here we see O'Neill, both before and after his term in George Pierce Baker's playwriting workshop at Harvard, experimenting with conventional genres, but the fascinating thing about these inadequate early plays is the ways in which they reflect the ideas and the characters of the later O'Neill. Rose in *The Web* (1913) is a distant cousin of Anna Christie; and the manipulative, disastrous ending of that somewhat foolish play is an early instance of O'Neill's belief that men and women are inextricably trapped by personality and society. Even the mild irony at the end suggests the final curtain of *Desire Under the Elms*. By the end of this volume, O'Neill, like the Provincetown Playhouse, where his work was first performed, had matured theatrically; he had written *Anna Christie* and *The Emperor Jones* and had won his first Pulitzer Prize with *Beyond the Horizon*.

Although there are plays in the second volume (1920-31) that show O'Neill still working in the realistic tradition—*All God's Chillun Got Wings*, for instance—most of the plays here are concerned only peripherally with Man

O'Neill wrote first play in 1913, won first Pulitzer in 1920, a Nobel in 1936.

in society. Increasingly, O'Neill was trying to confront Man's relation to himself and to God, to deal with psychology as fate or with Man's place in the Universe, and in the process he turned to distant cultures, to masks and to mythology. Some of his most famous plays come from this period—*The Great God Brown* and *Mourning Becomes Electra*—and it was these works that made him an international figure and brought him the Nobel Prize in 1936. The final volume (1932-43) finds the playwright returning to his own history and his Irish-American New England roots, and to "faithful realism. . . . the native eloquence of us fog people." *The Iceman Cometh* and *Long Day's Journey* may be examples of what Edmund dismisses as stammering, but they look like theatrical poetry to me.

Gerald Weales
Emeritus professor of English,
University of Pennsylvania

The Swing Era
The Development of Jazz: 1930-1945
Gunther Schuller
Oxford University Press, $30

If film was the arena in which white Swing Era America most fully represented itself to itself, music played that role for African-Americans. From the early 1930s through World War II, jazz—for the only time in its history—was the popular music of this nation.

In documenting this period, Gunther Schuller listened "systematically/chronologically" to more than 30,000 recordings—"tens of thousands of hours of listening." Spending time with this book is like having your own private docent take you on a tour through most of swing's discography.

Yet this very impressive work is marred by Schuller's failure to develop a coherent narrative. *The Swing Era* remains a group of essays rather than coming together as an integrated work as did *Early Jazz*, the first volume of this projected trilogy. Chief among the several themes that partially emerge from these 900 pages are the necessary ascendancy of the arranger with the advent of big-band music, the exploitation of black musical genres by whites, and the destruction of swing by commercialism. Furthermore, instead of the systematic chronology of jazz implied by Schuller's preface we get a gerrymandered account that begins the story of swing with the popular success of

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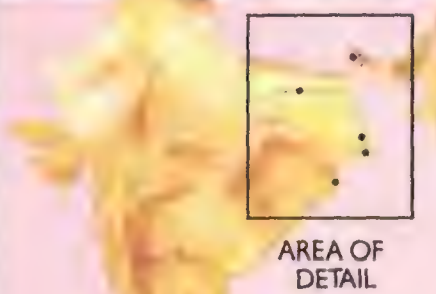

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Benny Goodman rather than with Fletcher Henderson, whose orchestra originated the call-and-response-cum-riff-chorus ensemble style.

But more serious than any organizational problem is the equivocal nature of Schuller's attitude toward the Swing Era and pop culture itself. The big-band era is historically important because it saw jazz become mainstream music, yet Schuller reveals himself as profoundly uneasy with vernacular expression. Often in the popular and jazz fields, he writes, ". . . with seeming inevitability groups and individuals decline after reaching some form of artistic peak." This seems a disaffected viewpoint for an aficionado.

However, Schuller can rise above his own parochialism, as he does in his reappraisal of Cab Calloway. Here he succeeds magnificently in his announced goal of evaluating the music in terms of its social context. The essay is an exemplary celebration of an idiomatic music equally popular with blacks and whites, "a many splendored musical expression . . . complex network of both individualistic and general styles. . . ."

Whatever Schuller's equivocations and bias, *The Swing Era* should be short-listed for everyone who would know American music.

Celestine Ware
New York writer

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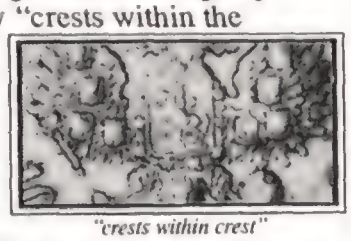

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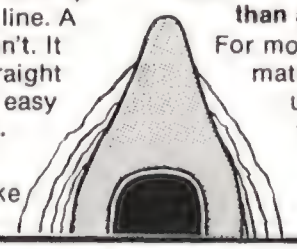

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Horizons (p. 10)

"When Parrots Learn to Talk, and Why They Can't: Domination, Deception, and Self-Deception in Indian-White relations" by Gerald Sider, *Comparative Studies in Society and History*, Vol. 29, 1987

Barns (p. 30)

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Guide to the Nudibranchs of California by Gary R. McDonald and James W. Nybakker, American Malacologists (Melbourne, Florida), 1980

Walters Art Gallery (p. 102)

Fifty Old Master Paintings from The Walters Art Gallery by Eric M. Zafran, Walters Art Gallery, 1988

Time Sanctified: The Book of Hours in Medieval Art and Life by Roger Wieck (exhibition catalog), George Braziller, 1988

Silver from Early Byzantium by Marlia Mundell Mango (exhibition catalog), Walters Art Gallery, 1986

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The Dreyfus Trials by Guy Chapman, Stein & Day, 1972

France and the Dreyfus Affair by Douglas Johnson, Walker and Company (New York), 1967

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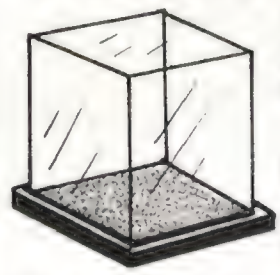

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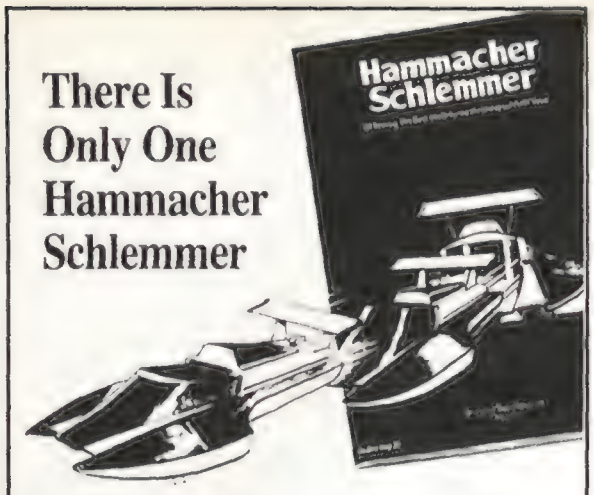

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Castle and Freer closings

The Castle, under renovation for the new Information Center, is closed to visitors until late 1989. The Freer Gallery of Art is closed until 1992.

Summer offerings

A number of free activities are scheduled throughout the Smithsonian this month. The Sackler Gallery is offering an extensive program of family activities, including programs every weekday at 12:30 P.M. in conjunction with the *Yani: The Brush of Innocence* show. At the Air and Space Museum, a number of free outdoor concerts are scheduled from 6-7 P.M. on weekdays. At the Ripley Center, special activities accompany an exhibit that re-creates traditional street festivals of the Caribbean (see page 18).

Call 357-2700 for details on all of the above activities and events.

Special August exhibits and events

Anacostia Museum
The Real McCoy: Afro-American Invention and Innovation, 1619-1930 (through November 5) An overview of outstanding black inventors and anonymous innovators who made important contributions to American technology.

Renwick Gallery
The Boat Show: Fantastic Vessels, Fictional Voyages (through August 6) Renditions of fanciful ships by 15 contemporary American artists.

National Museum of African Art
Gold of Africa: Jewelry and Ornaments from Ghana, Côte d'Ivoire, Mali and Senegal (through August 28) A celebration of the goldsmith's art.
The Essential Gourd (through January 4) Northern Nigerian decorative techniques, traditional and contemporary.
Royal Benin Art Creations from court artisans, spanning the 15th through the 19th centuries.

International Gallery, S. Dillon Ripley Center
Caribbean Festival Arts (through February 15, 1990) An exhibit of costumes, music, videotapes, photographs and performers evokes the sights and sounds of the Caribbean street festival (see *Around the Mall*, page 18).

National Museum of American Art
Photography of Invention: American Pictures of the '80s (through August 13) Images by 88 experimental practitioners.

Arthur M. Sackler Gallery
Yani: The Brush of Innocence (through October 22) Paintings by the internationally renowned 14-year-old artist.
Japanese Art: Recent Acquisitions (through September) A ceremonial palanquin and screens.

National Portrait Gallery
The Deaf Way: Albert Newsam Lithographs (through September 5) Portraits by the 19th-century deaf-mute artist.
Isamu Noguchi: The Portrait Sculpture (through August 20) Renderings of subjects from George Gershwin to Clare Boothe Luce.

National Museum of Natural History
Inside Active Volcanoes: Kilauea and Mount St. Helens (indefinite) The inner workings of two fire mountains, featuring murals, touchable geological specimens, instruments and interactive computerized video displays.
Orchid Illustrations by Regina Olson Hughes (through August 31) Botanical drawings by the illustrator and artist.
John Muir's High Sierra: A Watercolor

Diary by Tony Foster (through August 13) Images painted by the Cornish artist during the course of an eight-week hike in 1986.

Hirshhorn Museum & Sculpture Garden
Robert Moskowitz (through September 17) The first major retrospective for the New Image painter.
Directions: Keith Sonnier (August 2-October 29) Neon sculpture by the New York artist.
Houston Conwill "WORKS" (August 2-October 29) An outdoor installation evoking themes and events of the African-American experience.

National Museum of American History
American Television from the Fair to the Family, 1939-1989 (through April 1990) Artifacts tracing the rise of television in American culture.
Sesame Street (through October 15) A look back over 20 years.
The Ceremonial Court Permanent installation re-creates White House spaces from 1902 to the present.
The Way to Independence: Memories of a Hidatsa Indian Family, 1840-1920 (through September 30) A chronicle of the American Indian experience.

National Air and Space Museum
Eyewitness to Apollo 11 (through December 31) Paintings, drawings and prints interpreting the impact of the moon-landing mission.
Aeropittura Futurista: Images of Flight in Italian Art, 1913-1942 (through October 2) Works on paper and documents reflect the conception of flight through the lens of Italian Futurism.
Beyond the Limits: Flight Enters the Computer Age A major new gallery explores the computer revolution in the aerospace industry.

Cooper-Hewitt Museum (New York)
Views of Rome: Drawings and Watercolors from the Vatican Library (August 8-October 29) Eighty-five images, traveling nationwide for the first time outside the Vatican.
Polished Perfection: The Art of Turned-Wood Bowls (through October 1) Works by 21 North American masters and four early American settlers.

Exhibition catalogs

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Resident Associate Program

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War Requiem (August 8; 8:15 P.M.) The premiere of the silent film, in color, based on poet Wilfred Owen's experiences in World War I.
Rumillajta (August 24; 7 P.M.) Bolivian mountain music by the internationally acclaimed folk ensemble.
PREBOP/BEBOP/HARDBOP (August 3, 10, 17; 7 P.M.) Seventy years of jazz.

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Fullerton, California (August 12-September 10) *The Grand Generation: Memory, Mastery, Legacy,* Fullerton Museum Center.
Indianapolis, Indiana (August 5-September 3) *Victorian Gardens: A Horticultural Extravaganza,* Conner Prairie Museum.
Jackson, Mississippi (August 19-September 17) *Field to Factory: Afro-American Migration, 1915-1940,* Jackson State University.
New London, Connecticut (August 5-September 3) *Sea Stars,* Thames Science Center.

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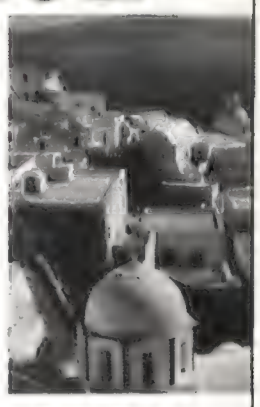

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NEW Detroit Auto Barons *September 14-17*: Visit their estates and a modern factory.

NEW Brooklyn with a Bang *September 14-17*: Includes *Jerome Robbins' Broadway.*

Appalachia *September 15-23*: Kentucky artists and writers introduce mountain heritage.

Bryce, Zion and the North Rim *October 4-13*: Hiking trip for all levels.

San Antonio-Austin *October 7-14*: Discover a rich mix of Hispanic and Anglo cultures.

Okefenokee *October 31-November 5*: Canoe in a wildlife refuge; for novice or expert.

NEW American Treasures—Colonial to Contemporary *November 17-20*: New York weekend featuring fine and decorative arts.

Christmas at Smithsonian *December 8-10*: Festive weekend of activities on the Mall.

Christmas in Santa Fe *December 20-26*: Observe Indian dances and local customs.

Christmas in Asheville *December 22-26*: Celebrate the holiday at historic Grove Park Inn and elegant Biltmore estate.

Everglades *January 30-February 7*: Canoe the Ten Thousand Islands.

Hawaii *February 4-14 or February 25-March 7*: Nature tour of Oahu, Hawaii and Maui.

Baja Whale Watch *February 23-March 3*: Explore islands from San Diego to San Ignacio Lagoon.

Foreign Study Tours

Countryside tours Space still available in fall for Hungary, Switzerland and Italy.

Himalayan Kingdoms *September 1-22*: Explore the fascinating world of Ladakh, Nepal and Bhutan.

Canadian Rockies *September 6-17*: Glorious hikes—Banff, Jasper, Lake Louise.

Indonesia *September 7-28*: In-depth look at culture, nature in Sumatra, Java and Bali.

Russia's Golden Ring *September 9-23*: Moscow, Leningrad, Pskov and Suzdal.

NEW Gardens of Ireland *September 10-24*: Castles, estates, private gardens.

Yugoslavia *September 12-24*

Iberian Ways *September 12-26*: Trace the history and culture of Portugal and Spain.

Heart of Asia *September 12-October 9*: Cross the USSR and China on epic tour along the ancient Silk Road. Goes around the globe.

Ireland Walks *September 14-26*

Seine Cruise *September 15-28*: Explore treasures of Flanders, Normandy and Paris.

Oxford Seminar *September 16-30*: Smithsonian's 11th year at this historic university.

Istanbul and the Aegean *September 27-October 9*: Cruise on the *Sea Cloud.*

Orinoco-Amazon Voyage *October 1-19*: For Contributing Members.

Gardens of Italy *October 4-15*: Botanical showplaces from Lake Maggiore to Vicenza.

Japan Journey *October 7-19*: Cultural overview in Kyoto, Tokyo and the countryside.

Australia-New Zealand *October 22-November 14*: Natural history, native culture.

Mexico—All Souls' Day *October 26-November 8*: Observe village celebrations, customs.

NEW Winter Interludes Uncrowded museums, cultural events and leisurely exploration in Paris, London, Venice, Vienna, Barcelona, Lisbon, Prague, Kyoto.

Argentina *November 12-27*: Explore fantastic natural and historical diversity.

Egypt Seminar *November 14-December 1*: Lectures in Cairo and a five-day Nile cruise.

Fiji *November 18-30*: Thanksgiving in a tropical paradise.

Smithsonian Christmas Holiday Stay in Canterbury, Winchester or Switzerland.

Siberian Winter Odyssey *January 10-27*

Mesoamerican Study Programs *January and February*: Yucatán, El Tajín or Guatemala.

South America Voyage *January 17-February 4*: Around the Horn on the *Seaborn Spirit.*

NEW Dakar (Senegal) *January 20-February 3*: History, culture, arts in West Africa.

India Wildlife Safari *January 23-February 20*: View rare species of birds and animals.

Kenya-Tanzania Wildlife Safari *January 25-February 11*: Unique journey in East Africa.

NEW Far East Express *February 17-March 3*: Singapore, Malaysia, Thailand by train.

Leningrad Arts *February 26-March 10*: Fine and decorative arts, superb museums.

NEW Jamaica in March Culture and customs of this West Indian island.

Red Sea Passage *March 1-12*: Egypt and Jordan including Luxor, Cairo and Petra.

NEW Trinidad-Tobago *March 3-13*: A birder's paradise in the West Indies.

Costa Rica *March 4-17*: Learn about flora, birds and other wildlife in the tropics.

India Arts and Crafts *March 8-April 4*: Focus on village artisans, local crafts.

Budapest Spring *March 14-25*: International performances, museum visits, excursions.

Sea of Cortés *April 1-8*: Cruise Mexico's Gulf of California—blue whales, wildlife.

Write to Smithsonian National Associate Program, Washington, DC 20560 or call (202) 357-4700 for tour and seminar brochures,

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Smithsonian Seminars

Join fellow Associates who share your special interests. Take part in seminars with Smithsonian curators and guest experts.

Oshkosh, Wisconsin *September 21-24*
Learn techniques of aircraft restoration during lectures and hands-on workshops at the EAA Air Adventure Museum in Oshkosh.

Santa Fe, New Mexico *October 10-15*
Study Hispanic, Indian and Anglo art or learn about archaeological discoveries in the Southwest.

Research Expeditions

Contribute your time, talent and financial resources to Smithsonian research. Work with curators at Washington, D.C. museums and archives, or at field sites around the country and the world.

Dynamics of an Active Volcano
Costa Rica *October 1-13; 15-27 or March 31-April 12*: Monitor Arenal Volcano's eruptions and study their effect on vegetation.

Yucatán Birdlife and Vegetation
Cancún, Mexico *February 16-26 or February 27-March 9*: Study migratory birds and forest vegetation in the aftermath of Hurricane Gilbert.

Smithsonian on the Move
Washington, D.C. *June 6-16*
Wrap, label and package the Smithsonian's collection of animal bones for transfer to a new facility.

Caribbean Plantations
Montserrat *July 1-14, 15-28 or July 29-August 11*: Excavate a cemetery at the former Galway sugar plantation.

Fossil Forests of Wyoming
Cody, Wyoming *July 15-28*
Collect 50-million-year-old plant fossils in the Big Horn Basin.

Frontier Days in Cheyenne
Cheyenne, Wyoming *July 20-30*
Document the role of the horse in this annual rodeo and Western festival.

The Horse in Crow Indian Culture
Billings, Montana *August 14-21, 1990*
Photograph, interview and record the annual Crow Fair festivities.

and (202) 357-1350 for expeditions.

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By Joseph Kastner

When spelling–Pow!–wurdz can get you down

One thing I have come to expect of myself as a journalist is that, when I start looking into something, I never know where I am going to come out. Once at the *New Yorker* I was sent to do a story on Chinese food and came back with one on the guardian of Grant's Tomb. So I wasn't really surprised, after setting out to understand my word processor's spelling methods, that I wound up with a constitutional crisis.

It began when I pressed the Control F2 keys to tell the spelling program to correct the typographical errors in a chapter I was writing about the young Audubon. The speller works by scanning the text, stopping at any word that is not in its lexicon of 115,000 terms. Then it displays correct spellings of words it thinks I meant to type.

Things went along nicely at first. It told me to take out the extra "t" I always put in "Cincinnati" and to insert a "c" that had slipped out of "occurrence." When it came to "Jean Jacques Audubon," it went along with "Jean" but stopped at "Jacques" and then offered me "jocose" or "jackass," both of which I rejected. Going on to "Audubon," it paused and then proposed "Autobahn." Dubiously I pressed on to the abbreviation "Mme." It gave me "mew, moo, meow." Confronting "ows" it came up with "ewes," "ass" and also "owl," which is what I had meant to type.

All this seemed pretty farfetched so I telephoned Word Perfect, the program I use, and learned that the speller's approach is based on phonetics and word skeletons. To construct a skeleton, a word is stripped of its vowels, leaving only consonants. Then an assortment of vowels and consonants is put back to reconstruct possible words. Thus "ows" is skeletonized to "WS" (the skeleton is always shown in capital letters) and various vowels are tried. In these terms "ewes" is as reasonable a reconstruction as "owl." Audubon becomes "ADBN" and since "t" is a phonetic relative of "d," "Autobahn" is expectable. So is "jackass" from "JCQS." This was somewhat familiar to me since, as a boy, I learned to read Hebrew, which prints many words without vowels.

This skeleton system led me into the history of English spelling, through centuries of frustrated efforts to straighten out a perverse language that gets maddeningly different sounds from the same letters (meat, great), gives different letters the same sounds (meat, greet) and rhymes "letters" with "debtors."

I started with a 13th-century Augustinian named Orm, a scholar of great stamina who devised a phonetic approach to spelling in a homily of 20,000 iambic lines. Next came Chaucer, who was irritated by the "gret diversite in Englissh and in writyng of oure tonge" but did nothing to remedy it.

The big disappointment was history's most celebrated lexicographer, Samuel Johnson. He knew his responsibility when compiling his dictionary but backed away, sacrificing uniformity of spelling in favor of customary usage in words like "convey and inveigh, deceit and receipt." Sir Isaac Pitman and George Bernard Shaw had more gumption. Having made a fortune from his shorthand system, Pitman then tried to simplify spelling, proposing such "simplifications" as "wurdz." Shaw willed enough funds for a whole edition of his *Androcles and the Lion* to be printed in a reformed spelling and distributed. But he never could do for English spelling what Henry Higgins did for Eliza Doolittle's English speech.

The reformer's trail detoured me to Gen. Andrew Jackson, who wrote that he would hold New Orleans "in spite of Urope and all hell." Almost a century later, Theodore Roosevelt defended his predecessor: "If that doesn't spell Europe," Teddy said, "what does it spell?"

Roosevelt himself took a licking over spelling. In 1906, he ordered the Public Printer to set his reports in a simplified system—"dropt" for "dropped," "thru" for "through." These modest proposals enraged Congress. "Imperial ukase," one member huffed and the House of Representatives moved to forbid the printer to spend any money on such heresies. Then it spent four days debating the President's constitutional right to spell as he wished versus the legislature's right to disapprove. When Congress unanimously voted that public documents must "adhere to standard orthography," Roosevelt meekly gave in.

Constitutional crisis or not, I realized that none of this reform had any relevance for me. I've never had much trouble with spelling. Most of my misspellings are brought about by a mild form of strephosymbolia, which causes me to invert letters—"teh" for "the," "glod" for "gold." In spelling bees back in grade school I would get by "questionnaire" and "recommendation" until, almost always, I faced Marian Trachtman, the girl I secretly loved.

I like to think that on the few occasions when I lost to Marian, it was because I did not want to make her unhappy. But up there, spelling away, I represented the boys of the class in our endless skirmish with the girls. So, when Marian spelled it "temperment" I chose honor over love. Even though I could hardly bring myself to see the sadness on Marian's face, I triumphantly recited ". . . e-r-A-m . . ."

I try now to summon up that sad look but all I can honestly recall about Marian is that she had long brown braids and was only a little taller than I was. The color of her eyes, the timbre of her voice—all are gone. Marian has become a skeleton in my remembrance, and I can no longer reconstruct her.

Ah love! Ah memory! Ah MRN!

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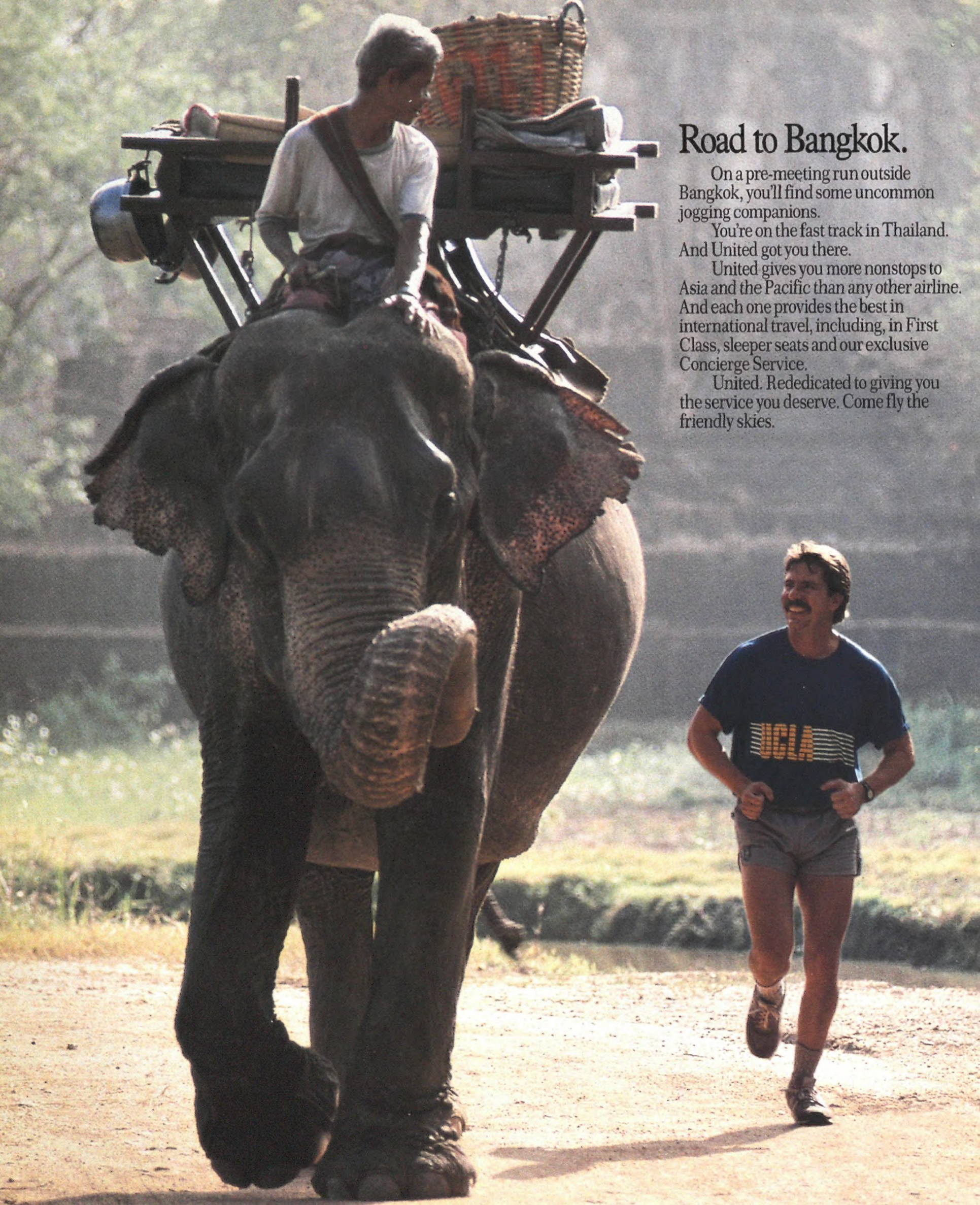

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